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Denver Research Refuge

INVESTIGATIONS OF WOODCOCK, SNIPE, AND RAILS IN 1956

SPECIAL SCIENTIFIC REPORT: WILDLIFE No. 34

UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
CANADIAN DEPARTMENT OF NORTHERN AFFAIRS AND NATIONAL RESOURCES
CANADIAN WILDLIFE SERVICE

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And
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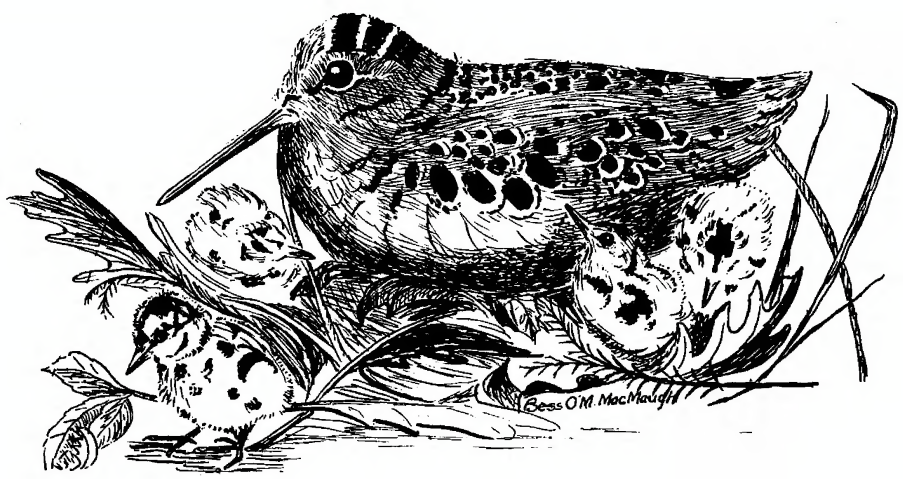

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PERSPECTIVE OF WOODCOCK, SNIPE AND RAIL INVESTIGATIONS - 1956

John W. Aldrich

U. S. Fish and Wildlife Service, Washington, D. C.

WHAT WE NEED TO KNOW

The agencies charged with directing the conservation and wise use of our wildlife resources must have knowledge of the requirements of each species, and current information on whether these requirements are being met. There must first of all be a chart to permit us to visualize what we need to know for sound wildlife management. This chart should show in easily decipherable form all of the pertinent information on the life history of the species in question with the more significant facts or danger points highlighted. Finally, the usefulness of this chart should be tested under practical operational conditions to see if it fulfills the requirements safeguarding the wildlife species.

The migratory game birds considered in this annual publication and included under the terms woodcock, snipe and rails are: American Woodcock (Philohela minor), Common Snipe (Capella gallinago), Clapper Rail (Rallus longirostris), Virginia Rail (Rallus limicola), King Rail (Rallus elegans), Sora (Porzana carolina), Yellow Rail (Coturnicops noveboracensis), Black Rail (Laterallus jamaicensis), Purple Gallinule (Porphyrula martinica), Common Gallinule (Gallinula chloropus) and American Coot (Fulica americana).

Some of the species of rails and gallinules, although classified as game birds under the migratory bird treaties, are so seldom hunted that, up to the present, little effort has been made to bring together information on them for game management.

The main things we need to know to be sure the migratory bird resources are adequately protected are: The exact habitat requirements, both qualitative and quantitative and what changes in amounts of these habitats are taking place; the details of distribution and migration; how the populations are fluctuating in abundance from year to year; the hunting pressure; and other mortality factors such as disease or poisons which are operating significantly against survival of the species.

WHAT ARE WE DOING ABOUT IT

The two Federal Agencies - U. S. Fish and Wildlife Service and Canadian Wildlife Service are currently putting most emphasis on getting information necessary for managing ducks and geese because of the great interest in hunting these groups of birds and the attendant danger to survival of these species. Consequently very little effort is currently being put into investigation of the woodcock, snipe and rail species by these agencies. The Canadian Wildlife Service encourages the obtaining of population information by its personnel when this can be done incidental to their main duties, but has no projects set up specifically for research on these species. Mr. Leslie

Tuck of that agency, stationed in Newfoundland, has contributed substantially to the knowledge of the life history of the Common Snipe in the last few years. The U. S. Fish and Wildlife Service has a few research projects pertaining specifically to these species. One is "The Investigation of Woodcock Populations" which, up to the present, has consisted entirely of the bringing together of information supplied by cooperators and reported in the pages of this publication. Two others are "The Migration of the Common Snipe" and "Investigation of Snipe Populations," both of which are assignments of Chandler S. Robbins, who devotes roughly one-half of his time to these two snipe problems combined. Vincent Reid and Phil Goodrum, also of this agency, have made winter population studies of woodcock in Louisiana for several years, incidental to quail investigations. Coot depredations on rice crops in California are being studied by Adolph Zajanc of the U. S. Fish and Wildlife Service. Fred Glover of the same agency is studying methods of aging coots by external characters. Leaders of Cooperative Wildlife Research Units at Land Grant colleges, including Howard L. Mendall at the University of Maine, and William G. Sheldon at the University of Massachusetts, who are in the employ of the U. S. Fish and Wildlife Service, are actively conducting research personally and supervising students in research on basic woodcock problems. Closely associated with the Wildlife Research Unit at Pennsylvania State University is Prof. P. F. English, who organizes the cooperative woodcock breeding ground count in the central-eastern region. In addition to the Government agencies, a number of State Conservation Departments, which are mentioned by name the reports beyond, are contributing valuable manpower to the cooperative woodcock breeding ground count. In the State of Pennsylvania there is an active project on the woodcock headed by Stephen Liscinsky. In New Jersey there is a project on the Clapper Rail led by L. G. MacNamara. Louisiana State University is contributing significantly in the work on migration of the woodcock through extensive banding on its wintering grounds by Leslie Glasgow and students.

Out of all these studies has come much information needed in constructing our wildlife management charts for migratory game birds, particularly in the field of habitat requirements and population inventory methods. A beginning has also been made on determining migration patterns of woodcock. Untouched are the fields of hunting pressure, disease and other mortality factors for most of these species.

SUMMARY OF 1956 INVESTIGATIONS

Woodcock Wintering Ground Studies.--Vincent Reid and Phil Goodrum of the U. S. Fish and Wildlife Service, continued their winter population counts of woodcock in Louisiana with the use of bird dogs. Leslie Glasgow and students at Louisiana State University continued their long-term banding and population studies in the vicinity of Baton Rouge, La. They invented an ingenious device for sexing woodcock easily at night and in bad weather. It is a plastic tool which measures relative bill length. It is hoped that research on the methods of making population estimates on the wintering grounds can be expanded to sample all of the important woodcock wintering areas. Since these birds are much more concentrated at that time of year than during the breeding season it may turn out that a winter inventory is the most efficient method of appraising the annual status of this species.

Figure 1

LOCATIONS OF WOODCOCK INVESTIGATIONS
1957

Woodcock Migration Studies.--Following upon his most valuable contribution to banding of wintering woodcock, Leslie Glasgow has now summarized all recoveries of banded birds in an attempt to bring to light a general pattern of migration. It will be noted that, as these data are interpreted, there is less crossing over of populations which breed east of the Appalachians to wintering grounds in the southern Mississippi Valley than had previously been supposed. It appears from Dr. Glasgow's analysis that the wintering birds of the lower Mississippi bottomlands at least are predominantly from the central northern breeding grounds.

Woodcock Breeding Ground Studies.--At the Massachusetts Cooperative Wildlife Research Unit, William Sheldon and his students are continuing their very significant, and so far unique studies of summer evening woodcock concentrations which seem to be part of a special feeding behavior. These concentrations offer excellent opportunities for capturing the birds in Japanese mist nets and for furnishing data on age and sex ratios during the post-breeding season.

Claude Z. Westfall and Robert B. Weeden, students at the University of Maine, published a description of plastic neck markers used on woodcock with good effect to study movements of these birds on their breeding grounds. (Journ. Wildl. Mgt. 20:218-219, 1956.).

This year for the first time an attempt has been made to stratify the woodcock populations in accordance with population density levels. Life zone boundaries as recently revised by the author (Ms.) were used as a trial basis for grouping (Map, Fig.1). It had been expected that considerable average difference would be found between the woodcock populations in the Alleghenian and Carolinean Zones, which together form the primary breeding area of the species. This did not prove to be the case however. The average birds per stop for the two zones are remarkably similar - 0.71 for the Alleghenian and 0.65 for the Carolinean. Therefore, if woodcock breeding density is different in these two zones, as casual observation would seem to indicate, it is masked by the method of selecting census routes. This is very likely the case, since the routes are not randomly located, but in most cases chosen by the observer on the basis of his knowledge of woodcock distribution. The true relationship of woodcock breeding densities in these two zones will not be known until compared on the basis of truly randomized distribution of routes.

On the assumption that woodcock singing ground counts are representative of some unit of breeding ground area, an attempt has been made to weight the data on an area-density basis. The total land areas of states have been used as the trial units. Table 1 lists the average number of woodcock per stop for each state in which counts were made covering the years 1954, 1955 and 1956. These averages are multiplied by the total land area of the state where the samples were obtained to give a "breeding index" based on both the density and the area in which that density is supposed to apply. The weakness, of course, is that there is no uniformity, and in fact in many cases great dissimilarity,

Table 1.--Weighting of Samples by States

EASTERN REGION

State	1954-1956 Average Woodcock Per Stop	Sq. Miles in Land Area Utilized	Breeding Index	Percent of Total	
				Eastern	Both Regions
New Brunswick	1.0	27,985	27,985	15.2	6.4
Nova Scotia	0.9	21,068	18,961	10.3	4.3
Prince Edward Id.	0.5	2,184	1,092	0.6	0.2
Maine	0.6	31,040	18,624	10.1	4.3
New Hampshire	0.4	9,024	3,610	2.0	0.8
Vermont	0.8	9,278	7,422	4.0	1.7
Massachusetts	1.0	7,907	7,907	4.3	1.8
Connecticut	0.5	4,899	2,450	1.3	0.6
New York	0.8	47,929	38,343	20.8	8.8
New Jersey	0.5	7,522	3,761	2.0	0.9
Pennsylvania	0.7	45,045	31,532	17.1	7.2
Delaware	0.5	1,978	989	0.5	0.2
Maryland	0.7	9,887	6,921	3.8	1.6
North Carolina	0.3	49,142	14,743	8.0	3.3
Total eastern			184,340		42.2

WESTERN REGION

State	1954-1956 Average Woodcock Per Stop	Sq. Miles in Land Area Utilized	Breeding Index	Percent of Total	
				Western	Both Regions
West Virginia	0.5	24,090	12,045	4.8	2.8
Kentucky	0.3	40,109	12,033	4.8	2.8
Ohio	1.0	41,122	41,122	16.3	9.4
Michigan	0.9	57,022	51,320	20.3	11.7
Wisconsin	0.6	54,715	32,829	13.0	7.5
Minnesota 1/2	0.5	40,005	20,003	7.9	4.6
Ontario 1/3	0.5	137,527	68,764	27.2	15.7
Quebec 1/8	0.2	74,357	14,871	5.9	3.4
Total western			252,987		57.8
Total both regions			437,327		

in the amount of good woodcock habitat in the different states. We have no way of correcting for this difference at present, however.

Despite the obvious weaknesses in the data it is thought the number of woodcock per stop for any given state will be more meaningful when multiplied by breeding indexes for that state. It is obvious from Table 1 that although Massachusetts has a higher average number of woodcock per stop on its routes than Pennsylvania, the latter state because of its size has a larger percentage of the total woodcock population and thus a higher breeding index than Massachusetts. Thus when samples from the two states are compared they should be multiplied by their respective breeding indexes to truly represent the total populations of which they are presumed to be samples.

It should be noted that in computing the weighting factors only the portions of Ontario and Quebec which are below the Canadian Zone (Boreal spruce-fir forest area) are included. It is assumed that the species does not breed in significant numbers north of the Alleghenian Zone (pine-hemlock-northern hardwood forest area). Furthermore, only the Alleghenian and Carolinean Zones of Minnesota are used, excluding the eastern prairie and parklands zones as non-productive areas for breeding woodcock.

In Table 1 the woodcock population figures are grouped into "eastern" and "western" groups based on whether the state is primarily east or west of the Appalachians and thus may be involved in an eastern or western migration pattern. It is noted that the western group has a breeding index 16% higher than the eastern.

Snipe Wintering Ground Studies.--Chandler Robbins continued his investigations of a method of determining population changes in the Common Snipe on its wintering grounds. In his report he has summarized the results of such study over a period of the last 5 years and has presented the results in comparison with a tabulation of the data obtained on Christmas bird counts of the National Audubon Society over the same period. The combined data indicate that there has been no significant change in abundance of snipe during that period. Based on statistical analyses, recommendations are given for improving the coverage of the January count necessary to give more dependable information on snipe abundance. It has also been pointed out by Walter Crissey that there is need for developing a weighting factor to apply to these winter snipe figures. This weighting factor should be based on relative population densities in different areas sampled and the size of the areas of a given density level. At present with most of the counts being made in Louisiana the estimated continental total may be unduly influenced by a local fluctuation in abundance in one state. Mr. Robbins is currently making studies to obtain information on the geographic variation in wintering snipe population density which will permit development of weighting factors.

Snipe Breeding Ground Studies.--Leslie M. Tuck of the Canadian Wildlife Service has made rather intensive studies of breeding Common Snipe in Newfoundland. He has discovered a number of facts which are significant in appraisal of breeding habitat and in development of census techniques. Collection of birds under observation has shown that females will winnow under certain circumstances; that each member of a pair of snipe maintains a separate territory during the breeding season; that females do all the setting on eggs and that males help with the care of young by assuming the responsibility of caring for two of the four young, leaving the other two in the care of the female; that each parent takes the young in its care to its respective territory.

Snipe Banding.--Banding of the Common Snipe on its wintering grounds was continued this year by Chandler Robbins in connection with his investigations of winter abundance of this species on the Gulf coast. Leslie Tuck has adapted for snipe the technique of luring birds into mist nets by playing tape recordings of their territorial calls. The discovery that this is possible is an important advance in the techniques of banding. There is need for a considerable increase of emphasis on the banding of this migratory game bird - the migration pattern of which is virtually unknown.

Rail Investigations.--We are pleased to be able to include in our summaries of work on migratory game birds this year some of the results of studies of Clapper Rails under a Federal Aid project in New Jersey. Fred Ferrigno's findings deal chiefly with the effect of storm tide conditions on the production of this species. Such conditions in 1955 were so severe that it was feared the species had suffered greatly and the Federal hunting season was reduced accordingly.

Brooke Meanley of the U. S. Fish and Wildlife Service published the results of a study on "Food habits of the King Rail in the Arkansas rice fields," (The Auk, 73:252-258, 1956).

WHERE DO WE GO FROM HERE?

We have now reached a point where we have obtained enough information pertinent to the subject of management of woodcock, snipe and rails that we need to sit down and try to put the pieces together and see what we have. On the results of our findings we should plan further work, possibly with entirely new approaches, to progress most rapidly toward our goal of accurately charting our courses of management. We must particularly reappraise our main approach to obtaining an annual population index of woodcock through singing ground counts in the breeding season. There is yet to be a test of this method using routes selected on a strictly randomized basis. There is need for further work on the proper weighting of population figures for both woodcock and snipe inventory methods. Much more consideration needs to be given to operating and testing wintering ground counts of woodcock. Means should be found for determining hunting pressure on all species. There should be more effort to determine effect of changing habitat and ways to measure it. Methods of aging woodcock and snipe in the fall must be developed.

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THE WINTERING WOODCOCK POPULATION ON NOCTURNAL FEEDING SITES IN LOUISIANA IN 1955-56

Leslie L. Glasgow[1]

Louisiana State University

An investigation of the ecological conditions effecting the American woodcock on its wintering ground was continued in the vicinity of Baton Rouge in 1955-56. Since data were gathered in the same manner as in previous years, it was possible to compare changes from other years in the number of birds that were observed on nocturnal feeding sites during banding operations.

Method

For each nocturnal banding trip records were kept of the number of men per party, total time on nocturnal feeding sites of woodcock and total number of woodcock observed as well as other data.

Discussion

Cold weather, which extended to the Gulf States, occurred over much of the United States during November in 1955, thus woodcock were forced into Louisiana in fair numbers by mid-November. Since soil moisture was high, 14 woodcock were seen November 7 on nocturnal feeding sites. Ground moisture remained high through December when a record number of 2120 woodcock were observed. However, a prolonged dry period occurred in January 1956 and as a result fewer woodcock were found. The weather remained cold through the latter part of January and the first half of February consequently many woodcock did not begin their northward migration until mid-February, fully three weeks later than on some years. Two hundred-thirty-seven birds were seen on February 8, 54 on February 9, and 43 on February 14. After woodcock left the Baton Rouge area, cold weather through the Lake States in February and March probably delayed their arrival on the breeding ground.

As indicated in Table I, the number of woodcock observed per man hour was higher than in any previous year and 41 per cent higher than the number seen in 1954-55. This high number was undoubtedly a result of the very favorable moisture conditions through most of the winter and the cold weather which prevailed at the beginning and again at the end of the season. In order to compensate for local shifts in the wintering population it would be highly desirable to extend the sampling to include a much larger area.

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(1) L.S.U. School of Forestry and Agricultural Experiment Station and Wildlife Department, Texas A & M.

TABLE I

WOODCOCK OBSERVED PER SEASON

	Year			
	52-53[2]	53-54	54-55	55-56
November				
No. woodcock	-	59	2	93
No. man hours	-	24.00	0.50	31.25
Birds/man hour	-	2.46	4.00	2.97
December				
No. woodcock	910	1185	271	2120
No. man hours	172.00	175.25	37.75	219.75
Birds/man hour	5.29	6.76	7.18	9.64
January				
No. woodcock	562	706	689	1248
No. man hours	124.50	85.75	134.75	152.75
Birds/man hour	4.51	8.23	5.11	8.17
February				
No. woodcock	9	-	664	669
No. man hours	17.50	-	126.50	134.50
Birds/man hour	.51	-	5.24	5.0
Season's total				
No. woodcock	1481	1950	1626	4130
No. man hours	314.00	285.00	299.25	538.25
Birds/man hour	4.76	6.84	5.43	7.67

(2) From P-R Section; Louisiana Wild Life and Fisheries Commission

Acknowledgments

Funds to continue this study in 1955-56 were contributed by the Wildlife Management Institute, Washington, D. C. Much of the field work was completed by Game Management students in the L.S.U. School of Forestry.

WINTERING WOODCOCK OBSERVATIONS IN WEST-CENTRAL LOUISIANA 1955-56

Vincent H. Reid and Phil Goodrum

U. S. Fish and Wildlife Service, Alexandria, Louisiana

Wintering woodcock inventory work was conducted for the seventh season on longleaf pine lands of Vernon, Natchitoches, and Rapides Parishes, Louisiana, from November, 1955 to February 14, 1956.

Method

Bird dogs were used in the inventory work; a record was kept of the number of woodcock points made by the dogs and the time spent afield. Generally, two dogs were down at one time.

Inventory Data

Migration.--Some woodcock were present in the area in October. Game Agent C. V. Carlton flushed one bird north of Alexandria, Louisiana, on October 2, 1955. Working with dogs, Meanley and Reid observed woodcock on October 29 and 31 near Glenmora in Rapides Parish.

Table 1 shows the hours per woodcock find by weeks from November through the second week in February. With the exception of the first and second weeks in November and the fifth week of January, the dogs were in the field some each week. Woodcock were found in all weeks except the first week of January and the first week of February. The second week of January was also poor; only one point was made in 17.75 hours of dog work.

The best weekly count was made during the fourth week of January. In 10.5 hours, the dogs made 13 finds, for an average of one bird for each 0.8 hours of work.

Best weekly counts have varied from the third week in January to the first week in February during the past seven years. The figures are underscored in Table 1.

Table 1.

Hours per Woodcock Point by Weeks for the Winters 1949-50 Through 1955-56, West-Central Louisiana

Month & Week	1949-50	1950-51	1951-52	1952-53	1953-54	1954-55	1955-56
Nov.							
1st week	-[1]	-	-	4.00	3.00	-	-
2nd week	-	-	7.5	3.75	5.00	-	-
3rd week	-	-	-	-	-	0.00[2]	3.75
4th week	-	4.7	2.0	2.0	3.3	0.75	2.00
5th week	-	6.0	1.5	-	1.6	1.08	5.12
Dec.							
1st week	0.8	2.6	12.5	13.75	1.9	2.43	4.44
2nd week	1.1	1.4	3.5	-	1.6	0.81	2.28
3rd week	1.3	2.3	5.6	1.4	14.5	0.00	1.00
4th week	0.8	-	4.6	1.8	6.0	0.00	2.41
Jan.							
1st week	0.6	-	2.6	1.5	0.7	0.00	0.00
2nd week	1.4	4.5	2.4	1.5	1.9	2.87	17.75
3rd week	0.8	0.5	0.6	-	0.5	0.80	6.25
4th week	2.5	1.1	3.0	0.7	1.2	0.34	0.80
5th week	1.3	0.6	2.3	0.3	-	-	-
Feb.							
1st week	0.4	1.3	2.7	5.0	2.7	1.85	0.00
2nd week	-	-	1.6	1.0	2.5	0.80	2.20
3rd week	-	-	-	-	-	1.64	-

1. -, no field work

2. Field work, but no woodcock seen

As in the past, the best individual count was made the latter part of January. A woodcock point was made for each 0.5 hours afield on January 25. Table 2 shows the dates of the best individual counts 1949-50 to 1955-56. Days of best counts have varied from January 13 to February 5.

Woodcock were still present in the area on February 14 when the last count was made.

Table 2.

Dates of Highest Woodcock Counts with Bird Dogs, Winters 1949-50 Through 1955-56

Winter	Date of Highest Count	Hours per Woodcock
1949-50	February 5, 1950	0.33 (20 minutes)
1950-51	January 15, 1951	0.26 (15 minutes)
1951-52	January 17, 1952	0.25 (15 minutes)
1952-53	January 25, 1953	0.11 (7 minutes)
1953-54	January 13, 1954	0.40 (24 minutes)
1954-55	January 29, 1955	0.25 (15 minutes)
1955-56	January 25, 1956	0.50 (30 minutes)

Summary Winter Counts.--From November through February 14, 116.1 hours were spent in the field with dogs; 42 woodcock points were made. For the period, the dogs averaged a point each 2.7 hours afield.

The counts indicate fewer woodcock using the longleaf pine area of west-central Louisiana in 1955-56 than in 1954-55. For in 1954-55, the dogs averaged a woodcock point for each 1.1 hours in 123.5 hours of field work (Table 3).

Inventory figures for the last seven seasons are summarized in Table 3. In four of the seven winters, the dogs averaged a woodcock point for about each hour afield; these winters were 1949-50, 1950-51, 1952-53 and 1954-55. In three of the seasons, 1951-52, 1953-54 and 1955-56, the dogs averaged a point for about each two hours afield. The 1955-56 season shows up as the poorest in the seven years with an average of a point for each 2.7 hours of dog work.

Table 3.

Summary Woodcock Inventory Figures and Precipitation in Inches as Recorded at the Leesville, La. Weather Station, 1949-50 - 1955-56

Winter	Hours of Dog Work	No. of Woodcock	Hours per Woodcock	Precipitation October through February
1949-50	129.5	117	1.1	32.21
1950-51	166.5	145	1.1	18.80
1951-52	273.0	125	2.1	11.25
1952-53	223.3	172	1.2	22.29
1953-54	232.0	120	1.9	14.83
1954-55	123.5	110	1.1	22.60
1955-56	116.1	42	2.7	15.61

Weather

Past observations indicate that fall and winter rains are important in conditioning the longleaf pine area of west-central Louisiana as favorable wintering woodcock habitat. Fall and winter precipitation was low in 1955-56. From October through February, 15.61 inches were recorded. However, 5.8 inches of this occurred in February, which was actually too late in the season to have much influence on the number of wintering birds using the area. Many of the streams, branches, baygalls, seepy hillsides, and post oak flats which would ordinarily house birds in moist years were dry and had none or only a few woodcock in 1955-56. The lack of favorable woodcock feeding areas, because of insufficient moisture, was probably the chief reason that fewer birds were found in the area in 1955-56.

Precipitation records for the past seven seasons are shown in Table 3. In the seasons 1949-50, 1950-51, 1952-53 and 1954-55, when the dogs averaged about a point an hour, fall and winter precipitation amounted to more than 18 inches. In the years 1951-52, 1953-54 and 1955-56, when the dogs averaged a find for each 2 hours or more, fall and winter rains totaled less than 16 inches. Seemingly, the critical precipitation range is between 16 and 18 inches.

Summary

1. Bird dogs were used for woodcock inventory work in the longleaf pine lands of Vernon, Natchitoches and Rapides Parishes, Louisiana, during the winter 1955-56.

2. Sight records and work with the dogs indicate that woodcock were present in the area in October.

3. Except for the first week of January and the first week of February, some woodcock were found every week that the dogs worked from the third week of November to the second week of February. The dogs did not work the first two weeks of November or the fifth week of January.

4. The peak week for woodcock finds, with a point per 0.8 hours, was the fourth week of January. The peak individual count was made on January 25 when the dogs averaged a point for each 0.5 hours afield.

5. Woodcock were still present in the area when the last count was made on February 14.

6. The inventory indicated fewer woodcock wintering in the long-leaf pine area of west-central Louisiana in 1955-56 than in 1954-55. In 1955-56 the dogs worked 116.1 hours, made 42 woodcock finds, and averaged a point for 2.7 hours. In 1954-55 the dogs worked 123.5 hours, made 110 woodcock finds and averaged a bird per 1.1 hours.

7. Seemingly, fall and winter rains are important in conditioning the piney-woods as favorable woodcock habitat, and, apparently, have some bearing on the number of birds found in the area. Fall and winter precipitation was less in 1955-56 (15.8 inches) than in 1954-55 (22.6 inches), and fewer birds were found.

8. From the data gathered over the past seven years on woodcock numbers and fall and winter rains, it appears that the critical precipitation range is between 16 and 18 inches. When October through February precipitation was more than 18 inches, the dogs averaged a point an hour for the season. When rains were less than 16 inches, the dogs only averaged a point for two or more hours work.

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WOODCOCK SINGING GROUND COUNTS IN CANADA - 1956

V. E. F. Solman

Canadian Wildlife Service
Ottawa, Ontario

Locality and Route No.	Observer	No. of Trips	Total Birds all Trips	Total Stops all Trips	Av. No. Birds per Stop	1955 Av. No. Birds per Stop
NEW BRUNSWICK						
11 York Co. Mazerol Settl.	B.S.Wright	1	8	10	.800	.900
10 York Co. Charter's Settl.	"	1	6	10	.600	.900
9 York Co. Kinsley Bridge	"	1	8	10	.800	1.000
8 York Co. Richibucto Rd.	"	1	18	11	1.636	2.400
3 Westmorland Co. Aulac Rd.	B.C.Carter	3	4	19	.211	.143
2 Westmorland Co. Cookville Rd.	"	2	14	16	.875	1.188
1 Westmorland Co. Rockport Rd.	"	2	16	16	1.000	.750
6 Westmorland Co. Turtle Creek Rd.	"	2	52	22	2.364	2.909
NOVA SCOTIA						
2 Kings Co. Greenfield Div. St.	R.W.Tufts	2	9	10	.900	.895
3 Kings Co. Melanson Mt.	"	2	10	10	1.000	.929
4 Kings Co. "Miner Meadow Rd."	"	3	9	11	.818	1.000
ONTARIO						
10 Frontenac Co. Collins Lake	A.Erskine J.Cartwright	3	5	21	.238	.0
9 Frontenac Co. Holleford	" "	3	2	24	.083	.167
7 Frontenac Co. Westbrook	" "	3	10	36	.278	.125
3 Russell Co. Vars	V.E.F. Solman	2	9	24	.375	.750
12 Carleton Co. Hy.15, Stittsville	F.H.Schultz	2	15	18	.833	.750
4 Carleton Co. Carp #1	V.E.F.Solman	1	1	4	.250	
5 Carleton Co. Carp #2	"	2	6	4	1.500	

1955

Locality and Route No.	Observer	No. of Trips	Total Birds All Trips	Total Stops All Trips	Av. No. Birds per Stops	Av. No. Birds per Stop
PRINCE EDWARD ISLAND						
3 Queens Co. French Village Area	Sgt.A.M.Johnston	1	7	17	.412	.429
5 Kings Co. Martinvale Area	"	1	7	13	.538	--
4 Prince Co. Conway	"	1	2	10	.200	1.778
QUEBEC						
1 Gatineau Co. Chelsea, Mine Rd.	F. H. Schultz	2	3	24	.125	.563
TOTALS		41	221	340	.650	.658

WOODCOCK CENSUS STUDIES IN NORTHEASTERN UNITED STATES - 1956

Howard L. Mendall, Leader
Maine Cooperative Wildlife Research Unit
University of Maine

The 1956 woodcock census data for the New England States and New York were compiled by the writer who, as in previous years, served as coordinator for the northeastern region.

No changes were made in the census technique this year. A few old routes were dropped but several new routes were established in all states. This was especially gratifying in the case of New Hampshire where previous censusing had been confined to one area.

Geographical coverage throughout the region in 1956 was the best ever obtained. However, the total volume of data available for comparison was slightly less than in 1955. This was occasioned primarily because the Prescott Peninsula routes in Massachusetts were not included this year. This extensive area has been abandoned at the suggestion of William Sheldon who felt that cover conditions had changed adversely to such an extent that accurate census trends would not be obtained.

The 1956 census results by areas are shown in Table 1. The areas within a given state are grouped by counties and the counties arranged in alphabetical order. For comparison, the 1955 index figure is given for all except the new or revised routes.

Table 2 shows a summary by states of the 1956 data including that from both old and new routes.

Table 3 gives comparative figures for 1955 and 1956 for all routes which were run in both years. The 1955 index figures are not necessarily the same as those given in last year's report. Some of the 1955 routes were dropped this year and the index figures were adjusted to permit a direct comparison.

The census results indicated a general reduction in woodcock populations this year in all states. Although the percentage of decrease was slightly less than that which occurred last year, it may be of significance that this reduced population has occurred throughout the region for the second consecutive year.

Part of the decrease may have been more apparent than real. It was the opinion of most census takers that unusually adverse weather for checking occurred during the census period. This followed a retarded spring which found the birds very late in returning north. Thus, some of the cooperators who handled several routes were sometimes forced to census when optimum weather was not prevailing.

Population decreases were less noticeable in New York, Connecticut and Massachusetts than in the northern New England States. This might

be expected in this greatly retarded spring where winter conditions still prevailed in many of the northern covers at normal nesting time. In this connection it is of interest to note the situation in Maine. Heavy decreases in population occurred on many of the routes in northern and central Maine; in the southern counties and in the coastal belt, woodcock were only slightly reduced from last year.

As was explained a year ago, from the statistical viewpoint greater geographical coverage is more desirable than limited coverage with repeat census runs. Yet, many census takers this year were able to run their lines two or three times. So much variation occurs, especially in a year of adverse weather such as this, that these repeat runs are likely to enable a more accurate population figure to be obtained on a given route. Therefore, the writer recommends that, in future years, each route be run a minimum of twice when time permits; a third check would be desirable in event of excessive variation.

Census Organization

Within the several states, the 1956 census studies were organized by the following:

Maine: By Kenneth Hodgdon, Maine Department of Inland Fisheries and Game, and by the writer. Special assistance in eastern Maine was given by John Dudley, Louis Beckett, and by personnel of the Moosehorn National Wildlife Refuge.

New Hampshire: By Hilbert Siegler, New Hampshire Fish and Game Department.

Vermont: By Roger Seamans, Vermont Fish and Game Service; and by Ralph Minns, U. S. Fish and Wildlife Service for the Highgate and Swanton areas.

Massachusetts: By William Sheldon, Massachusetts Cooperative Wildlife Research Unit, with Russell Norris, U. S. Fish and Wildlife Service handling the Newburyport area.

Connecticut: By Ruth Billard, Connecticut Board of Fisheries and Game.

New York: By Charles Brown, New York Conservation Department.

In conclusion, the writer wishes to express his thanks to all the individual census takers. The present, excellent coverage is possible only because of the interest of so many people. Censusing this year was difficult because of the retarded spring and long periods of adverse weather. Yet, except in a few instances, the census takers made a special effort to meet the coordinator's deadline; this is greatly appreciated.

Table 1.--Woodcock Census Studies in the Northeast - 1956

	County Locality and Route No.	Observer	Total Birds All Trips	Total Stops All Trips	Av. No. Birds Per Stop Per Trip	1955 Av. No. Birds Per Stop Per Trip
MAINE						
1	Androscoggin Leeds	N.Fellows	1	9	0.1	0.2
60	Androscoggin Androscoggin R.	"	1	10	0.1	0.3
61	Androscoggin So. Auburn	"	6	10	0.6	0.6
62	Aroostook Haynesville	F. Dunn	8	8	1.0	1.6
63	Aroostook Bancroft	"	7	8	0.9	0.6
64	Aroostook Crystal Station	"	4	5	0.8	0.8
6	Aroostook Moro	"	2	8	0.3	0.9
65	Aroostook Pleasant Pond	"	2	9	0.2	0.1
137	Aroostook Amity	"	6	8	0.8	--
66	Aroostook Masardis	H.Carson	1	6	0.2	0.7
3	Aroostook Oxbow	"	3	13	0.2	0.5
4	Aroostook Wade	"	0	9	0.0	0.1
2	Aroostook Ashland	"	2	11	0.2	0.6
67	Aroostook So. Ashland	"	1	7	0.1	0.3
138	Aroostook Chapman	"	1	8	0.1	--
139	Aroostook Washburn	"	1	7	0.1	--
68	Aroostook N. Quimby Rd.	"	1	9	0.1	0.3
69	Aroostook E. Jemtland Rd.	"	0	6	0.0	0.7
7	Aroostook Hodgdon	H.Mendall	14	24	0.6	0.6
70	Aroostook-Penobscot Kingman	F.Dunn	7	10	0.7	0.8
71	Cumberland Highland Lake	N.Fellows	9	8	1.1	0.5

Table 1.--Woodcock Census Studies in the Northeast - 1956 (Contd.).

County Locality and Route No.	Observer	Total Birds All Trips	Total Stops All Trips	Av. No. Birds Per Stop Per Trip	1955 Av. No. Birds Per Stop Per Trip
MAINE (contd.)					
72 Cumberland Webber Road	E.Baker	11	8	1.4	1.4
73 Cumberland Flying Point	"	9	9	1.0	0.8
74 Cumberland Durham Road	"	12	10	1.2	1.2
75 Franklin Langtown	R.Boettger	6	9	0.7	0.2
10 Franklin Salem	"	6	8	0.8	0.7
140 Franklin Mt. Blue	"	2	8	0.3	—
9 Franklin Coplin	"	5	10	0.5	0.8
141 Franklin New Sharon	"	6	9	0.7	—
11 Hancock Amherst	J.Peppard	10	9	1.1	0.3
76 Hancock Great Marsh Rd.	"	3	7	0.4	1.0
77 Hancock Sullivan	"	6	12	0.5	0.8
78 Hancock Eastbrook #1	"	2	9	0.2	0.4
79 Hancock Eastbrook #2	"	4	9	0.4	0.9
80 Hancock Toddy Pond #1	"	4	10	0.4	0.5
81 Hancock Toddy Pond #2	"	10	7	1.4	1.4
15 Hancock Lamoine	"	17	18	0.9	0.8
83 Hancock Bayside	"	6	10	0.6	1.0
17 Kennebec Gardiner	W.Harris	14	14	1.0	0.8
85 Kennebec Sidney	J.Maasen	4	11	0.4	0.5
142 Kennebec Windsor	"	3	11	0.3	--
87 Kennebec Belgrade, R.135	W.DeGarmo	7	13	0.5	1.2
19 Kennebec Readfield	"	5	10	0.5	1.0

Table 1.--Woodcock Census Studies in the Northeast - 1956 (Contd.).

County Locality and Route No.	Observer	Total Birds All Trips	Total Stops All Trips	Av. No. Birds Per Stop Per Trip	1955 Av. No. Birds Per Stop Per Trip
MAINE (contd.)					
88 Kennebec Rome	W.DeGarmo	2	11	0.2	0.3
20 Kennebec Belgrade Stream	"	10	11	0.9	0.9
89 Kennebec Readfield Corner	"	3	11	0.3	0.3
21 Knox St. George	J.Maasen	6	10	0.6	0.5
143 Lincoln Bristol	"	5	8	0.6	—
90 Lincoln Dresden Mills	E.Baker	6	6	1.0	1.8
144 Lincoln Damariscotta Lake	J.Maasen	4	13	0.3	—
92 Oxford Chase Brook	N.Fellows	7	9	0.8	0.7
93 Oxford Canton Lake	"	5	9	0.6	0.6
94 Oxford E. Buckfield	"	3	9	0.3	0.2
23 Oxford Albany	"	9	8	1.1	1.0
145 Oxford Magalloway	"	8	11	0.7	—
91 Oxford Pleasant Pond	"	7	9	0.8	—
95 Oxford Merrill Corner	R.Parks	6	8	0.8	0.9
96 Oxford Durgintown	"	5	8	0.6	1.0
97 Oxford Porter	"	6	7	0.9	0.6
24 Penobscot Greenbush	C.Westfall	10	10	1.0	1.7
99 Penobscot No. Bradford	M.Smart	20	20	1.0	1.0
100 Penobscot Skin Pond	F. Dunn	2	10	0.2	0.4
30 Penobscot Chester	G.Aiken	10	20	0.5	0.4
28 Penobscot Kingman	"	3	9	0.3	1.4
102 Penobscot Winn	"	9	16	0.6	0.6

Table 1.--Woodcock Census Studies in the Northeast - 1956 (Contd.).

County Locality and Route No.	Observer	Total Birds All Trips	Total Stops All Trips	Av. No. Birds Per Stop Per Trip	1955 Av. No. Birds Per Stop Per Trip
MAINE (Contd.)					
29 Penobscot Enfield	G.Aiken	4	16	0.3	0.8
27 Penobscot Kenduskeag	D.Holmes	20	24	0.8	0.7
103 Penobscot Carmel	"	5	22	0.2	0.3
26 Penobscot Orono	D.Quick	2	10	0.2	0.3
104 Penobscot LaGrange	A.Barden	14	10	1.4	0.6
146 Penobscot Argyle	S.Howe	17	22	0.8	---
105 Penobscot Bradford, R.221	M.Smart	17	20	0.9	0.8
147 Piscataquis Wadleigh Brook	F.Dunn	9	8	1.1	1.3
106 Piscataquis Bernard Corner	M.Smart	15	22	0.7	0.5
107 Piscataquis Brownville	"	15	20	0.8	0.6
108 Piscataquis Medford	"	16	22	0.7	0.6
32 Piscataquis Williamsburg	"	13	18	0.7	0.4
109 Piscataquis Maple Road	"	15	24	0.6	0.8
33 Piscataquis Atkinson	"	13	18	0.7	0.7
110 Piscataquis Atkinson Corner	"	9	20	0.5	0.5
111 Piscataquis Abbot	J.Hunt	7	9	0.8	1.2
112 Piscataquis Blanchard	"	6	7	0.9	0.6
113 Piscataquis Sangerville	D.Holmes	0	8	0.0	0.6
114 Piscataquis Brann's Mills	"	5	16	0.3	0.4
36 Piscataquis Trout Brook	D. Kirk	11	12	0.9	0.7
35 Piscataquis T4R10	E.Beach	15	10	1.5	1.1
37 Sagadahoc Bowdoinham	E.Baker	6	7	0.9	0.6

Table 1.--Woodcock Census Studies in the Northeast - 1956 (Contd.).

County Locality and Route No.	Observer	Total Birds All Trips	Total Stops All Trips	Av. No. Birds Per Stop Per Trip	1955 Av.No. Birds Per Stop Per Trip
MAINE (Contd.)					
115 Sagadahoc Georgetown	J.Massen	6	10	0.6	0.4
116 Somerset Skowhegan	J.Hunt	7	18	0.4	0.8
117 Somerset Moose River	"	9	14	0.6	0.9
118 Somerset Anson #1	"	4	9	0.4	0.4
148 Somerset Anson #2	R.Boettger	4	11	0.4	--
119 Somerset Lake Embden	J.Hunt	11	10	1.1	0.8
41 Somerset Concord	"	10	24	0.4	0.5
42 Somerset Jackman	"	7	11	0.6	0.7
40 Somerset Madison	J. Hunt	8	24	0.3	0.7
149 Somerset E. New Portland	R.Boettger	9	10	0.9	--
150 Somerset Lexington	"	6	8	0.8	--
120 Somerset Detroit	D.Holmes	8	22	0.4	0.3
44 Waldo Montville	J.Maasen	7	12	0.6	0.6
121 Waldo Searsmont	"	3	8	0.4	0.8
122 Waldo Winterport	D.Holmes	13	20	0.7	0.4
43 Waldo Sandy Point	"	18	16	1.1	0.9
45 Washington Calais	H.Stanhope	4	10	0.4	0.5
46 Washington Charlotte #1	H.Mendall	23	14	1.6	1.6
47 Washington Charlotte #2	"	20	16	1.3	1.4
123 Washington Charlotte Station	"	14	14	1.0	0.7
48 Washington Meddybemps #1	"	8	15	0.5	1.1
49 Washington Meddybemps #2	"	5	12	0.4	0.5

Table 1.--Woodcock Census Studies in the Northeast - 1956
(Contd.)

County Locality and Route No.	Observer	Total Birds All Trips	Total Stops All Trips	Av. No. Birds Per Stop Per Trip	1955 Av. No. Birds Per Stop Per Trip
MAINE (Contd.)					
124 Washington Baileyville	H.Mendall	10	14	0.7	0.9
125 Washington Crawford Lake	"	4	8	0.5	0.4
50 Washington Cooper	"	13	16	0.8	0.9
51 Washington Alexander	J.Dudley	13	12	1.1	1.1
57 Washington Machias River	H.Blanchard	3	10	0.3	0.7
126 Washington Columbia Falls	"	6	11	0.5	0.6
127 Washington Jacksonville	"	7	11	0.6	0.9
128 Washington East Stream	"	3	12	0.3	0.4
129 Washington Marion	"	15	20	0.8	0.7
130 Washington Pembroke	"	3	10	0.3	0.4
131 Washington Smith Ridge	"	5	10	0.5	0.5
132 Washington Cutler	"	2	10	0.2	0.6
133 Washington Crowe Neck	"	5	10	0.5	0.3
134 Washington Topsfield	G.Aiken	1	9	0.1	0.8
52 Washington Edmunds #1	L.Bagley	12	18	0.7	0.4
53 Washington Edmunds #2	A.Davis	13	30	0.4	0.9
54 Washington Edmunds #3	L.Bagley	10	18	0.6	0.4
135 York No. Parsonsfield	R.Parks	5	8	0.6	1.5
136 York Maplewood	"	9	8	1.1	1.1
58 York Limerick	"	5	9	0.6	0.9
59 York Lyman	"	7	9	0.8	0.6
151 York Shaker Pond	"	7	9	0.8	--
152 York Wells	"	3	9	0.3	--

Table 1.--Woodcock Census Studies in the Northeast - 1956 (Contd.)

County Locality and Route No.	Observer	Total Birds All Trips	Total Stops All Trips	Av. No. Birds Per Stop Per Trip	1955 Av. No. Birds Per Stop Per Trip
NEW HAMPSHIRE					
1 Coos Pittsburg	F.Scott	4	12	0.3	0.8
2 Merrimack No. Pembroke	S.Dole	5	8	0.6	--
3 Merrimack Pembroke Hill	S.Dole	2	12	0.2	--
4 Rockingham Mill Pond Road	F.Greeley	3	11	0.3	--
VERMONT					
3 Addison Granville	H.Colton	6	10	0.6	0.4
10 Addison Lincoln #1	R.Fuller	9	11	0.8	0.9
11 Addison Lincoln #2	"	8	8	1.0	0.8
1 Addison Ripton	"	13	11	1.2	1.6
2 Addison Starksboro	"	7	10	0.7	1.0
12 Caledonia Hall's Brook	R.Seamans	4	7	0.6	1.0
19 Chittenden Pleasant Valley	J.Stewart	4	12	0.3	--
4 Essex Victory #1	R.Seamans	11	9	1.2	1.6
7 Franklin Swanton #1	R.Minns	11	20	0.6	1.0
14 Franklin Swanton #2	"	19	16	1.2	0.8
20 Franklin Highgate	"	12	10	1.2	--
15 Lamoille Lake Elmore	R.Seamans	5	9	0.6	1.3
16 Rutland Goshen	H.Colton	4	14	0.3	0.6
8 Rutland Shrewsbury	"	11	15	0.7	0.5
17 Rutland Pittsford	"	3	12	0.3	0.3
21 Rutland Tinmouth	"	2	15	0.1	0.1
18 Washington Warren	R.Seamans	9	11	0.8	0.6

Table 1.--Woodcock Census Studies in the Northeast - 1956 (Contd.).

County Locality and Route No.	Observer	Total Birds All Trips	Total Stops All Trips	Av. No. Birds Per Stop: Per Trip	1955 Av. No. Birds Per Stop: Per Trip
VERMONT (Cnntd.)					
9 Windham Halifax	R.Seamans	3	8	0.4	0.3
MASSACHUSETTS					
5 Essex Newburyport	R.Norris	11	7	1.6	1.9
4 Franklin Leverett	E.Howard	10	8	1.3	1.0
6 Franklin Shutesbury	G.Hobart	6	9	0.7	0.7
3 Worcester MDC-Quabbin	W.Sheldon	18	16	1.1	1.2
2 Worcester Gate 40-Quabbin	"	9	15	0.6	0.8
CONNECTICUT					
1 Hartford Glastonbury	M.Beldon	4	16	0.3	0.5
14 Hartford Barkhamsted #1	A.Lamson	10	33	0.3	0.3
2 Hartford Barkhamsted #2	"	9	30	0.3	0.4
3 Hartford Farmington	J.Bishop	4	12	0.3	0.3
5 Litchfield Litchfield #1	R.Billard	12	18	0.7	0.9
6 Litchfield Litchfield #2	"	3	18	0.2	0.3
15 Litchfield Sandtown Rd.	W.Sondrini	3	18	0.2	0.3
17 Middlesex Portland	M. Arnold	8	14	0.6	--
18 New Haven Wallingford	T.Bampton	25	18	1.4	--
9 New Haven No. Branford	O.Beckley	4	12	0.3	0.4
10 New Haven Guilford	"	18	18	1.0	0.8
16 New London Montville	R.Billard	4	6	0.7	0.8
11 Tolland Shenipsit #2	"	7	21	0.3	0.1
12 Tolland Shenipsit #3	"	4	6	0.7	0.4

Table 1.--Woodcock Census Studies in the Northeast - 1956 (Contd.).

County Locality and Route No.	Observer	Total Birds All Trips	Total Stops All Trips	Av. No. Birds Per Stop	Av. No. Birds Per Trip	1955 Av. No. Birds Per Stop	1955 Av. No. Birds Per Trip
NEW YORK							
1 Albany Partridge Run	C.Brown	2	7	0.3	0.8		
2 Albany Dunbar Hollow	R.Carl	13	22	0.6	0.5		
3 Albany Delmar	R. Smith	27	30	0.9	0.7		
4 Albany Bozenkill	J.Reilly	2	9	0.2	0.2		
5 Allegany Hanging Bog	L.Cooper R.Stewart	8	10	0.8	0.2		
23 Chautauqua Goose Creek	F.Morrell	3	6	0.5	--		
7 Chenango Pharsalia	P.Kelsey	10	18	0.6	0.6		
8 Essex Putnam Creek	G. Davis	37	33	1.1	0.8		
9 Essex Wilmington	R.Mulvey	26	33	0.8	0.9		
10 Franklin Lyon Brook	G.Chase	21	24	0.9	1.8		
11 Hamilton Indian Lake	R.Carl	12	18	0.7	0.7		
14 Jefferson Ives Street Rd.	S.Northrup	10	16	0.6	0.8		
24 Jefferson Rodman	"	10	10	1.0	--		
12 Onondaga Baldwinsville	M.Alexander	28	30	0.9	1.5		
15 Oswego Happy Valley	C.Brown	10	22	0.5	0.6		
13 Rensselaer Buck's Corner	"	2	10	0.2	0.6		
16 Saratoga Reynold's Corner	W.Buckley	7	18	0.4	0.6		
18 Tomkins Dryden	R.Minnick	6	10	0.6	0.5		
22 Washington Adamsville	W.Buckley	5	16	0.3	0.4		
25 Wayne Wayne Center	R.Cottrell	40	18	2.2	--		

Table 2.-- 1956 Summary by States - All Data

	Total Stops All Trips	Total Birds All Trips	Av. No. Birds Per Stop Per Trip
Maine	1571	974	0.62
New Hampshire	43	14	0.33
Vermont	208	141	0.68
Massachusetts	55	54	0.98
Connecticut	240	115	0.48
New York	360	279	0.78
Totals	2477	1577	0.64

Table 3.--Comparative Census Data by States, 1955 and 1956
(Only routes censused during both years)

State	Year	Total Stops All Trips	Total Birds All Trips	Av.No.Birds Per Stop Per Trip
Maine	1955	1393	1017	0. 73
	1956	1400	890	0.64
New Hampshire	1955	12	9	0.75
	1956	12	4	0.33
Vermont	1955	166	135	0.81
	1956	186	125	0.67
Massachusetts	1955	72	76	1.06
	1956	55	54	0.98
Connecticut	1955	209	88	0.42
	1956	208	82	0.39
New York	1955	396	286	0.72
	1956	326	226	0.69
TOTALS	1955	2248	1611	0.72
	1956	2187	1381	0.63

WOODCOCK SINGING GROUND COUNTS FOR THE MIDDLE ATLANTIC STATES FOR 1956

Ward M. Sharp, Leader (Pennsylvania Cooperative Wildlife Research Unit)
Pennsylvania State University

Personnel for the following agencies aided in the gathering of these data for 1956. We wish to thank those cooperators within the agencies listed and also those persons in private life who contributed their time to make this census a success.

Board of Game and Fish Commissioners, Dover, Delaware.
Wildlife Resources Commission, Raleigh, North Carolina.
Department of Conservation and Economic Development, Trenton, New Jersey.
Pennsylvania Game Commission, Harrisburg, Pennsylvania.
The Pennsylvania State University, Dept. of Zoology and Pennsylvania Cooperative Wildlife Research Unit, University Park, Pennsylvania.
West Virginia Conservation Commission, Charleston, West Virginia.
Department of Natural Resources, Columbus, Ohio.
Department of Fish and Wildlife Resources, Frankfort, Kentucky.

TABLE 1.

Woodcock Singing Ground Census for 1955 and 1956

Locality and Route No.	Observer	No. Occupied Singing Ground 1955	1956
DELAWARE			
1 Kent Co. Petersburg	E. B. Chamberlain	4	3
2 New Castle Co. Golts	A. J. Florio	5	5
NORTH CAROLINA			
1 Chatham Co. New Hope Farm	Donald J. Hankla	7	7
2 Burke Co. Glen Alpine	E. R. Smith, Jr.	1	1
3 Burke Co. Southern R.R. Tr. E.	E. R. Smith, Jr.	1	1
4 Burke Co. Highway 70	E. R. Smith, Jr.	0	1
5 Henderson Co. Old N. Main St.	Rex L. Bird	5	3
6 Henderson Co. Tracy Grove Road	Rex L. Bird	4	2

Table 1.--Woodcock Singing Ground Census for 1955 and 1956 (Continued)

Locality and Route No.	Observer	No. Occupied Singing Ground 1955	1956
NORTH CAROLINA (continued)			
7 Burke Co. Southern R.R. Tr. W.	E. R. Smith, Jr.	1	0
8 Martin Co. Conoho Farm	W. A. Goodson	8	3
9 Alamance Co. Cane Creek	Chas. E. Hill	1	1
NEW JERSEY			
1 Ocean Co. Archer Creek	P. D. McLain	2	3
2 Atlantic Co. Tuckahoe	Fred Ferrigno	7	6
3 Sussex Co. Walpack	R. A. Spinks	3	5
4 Cumberland Co. Haleyville P.S. Grds.	E. G. Bevan	3	3
PENNSYLVANIA			
1 Centre Co. Barrens	Robert Chambers	6	1
2 Huntingdon Co. Stone Valley	Ward M. Sharp	14	5
3 Centre & Blair Co. Bald Eagle	Wilmer C. Richter	9	8
4 Centre Co. Port Matilda	Steve Liscinsky	13	9
5 Centre Co. Martha Furnace	R. G. Wingard	11	8
6 Centre Co. Julian	Don Miller	3	2
7 Centre Co. Unionville	Rev. Miller	3	2
8 Mifflin Co. Atkinson Mills	J. W. Taylor & C. Kuhn	4	4
9 Juniata Co. Mifflin	W. B. Taylor	3	3
10 Franklin Co. Upper Strasburg	Glenn L. Bowers	3	8
11 Perry Co. New Bloomfield	Harvey Roberts	2	4

Table 1.--Woodcock Singing Ground Census for 1955 and 1956 (Continued)

Locality and Route No.	Observer	No. Occupied Singing Ground 1955	1956
PENNSYLVANIA (continued)			
13 Westmoreland Co. Ardara	Joe Liss	3	3
14 Huntingdon Co. Neff Mills	R. E. Melton	--	3
15 Pike Co. Blooming Grove	A. J. Kriefski	7	4
17 Warren Co. Pittsfield	Elton Barton	6	2
18 Warren Co. Clarendon	Ivan M. Warner	4	2
19 Indiana Co. Penn Run	Robert L. Snyder	2	3
20 Lackawana Co. Thornhurst	Steve Kish	12	7
21 Luzerne Co. Freeland	Steve Laputka	8	9
22 Crawford Co. Geneva	H. Pratt	3	4
23 Venango Co. Emlenton	C. L. Decker	4	4
24 Erie Co. McKean	C. W. Harned	--	7
26 McKean Co. Betula		9	6
27 McKean Co. Coryville	K. B. Ogilvie	3	0
28 McKean Co. Marvindale	J. D. Shelander	5	9
29 Erie Co. Albion	W. D. Jones & W. E. Lee	3	2
30 Jefferson Co. Brookville	J. Zarichansky	4	6
31 Potter Co. Millport	Otis Robbins	8	7
32 Mercer Co. Sharpsville	D. A. Carbone	2	2
33 Washington Co. Washington	G. T. Church, Jr.		7*
34 Lycoming Co. Wallace Run	Irvin E. Plants		11*
35 Tioga Co. Fall Brook	S. Liscinsky		10*

Table 1.--Woodcock Singing Ground Census for 1955 and 1956 (Continued)

Locality and Route No.		Observer	No. Occupied Singing Ground 1955	1956
PENNSYLVANIA (continued)				
36	Erie Co. Beacon	C. W. Harned		7*
37	Centre Co. Buffalo Run	Rev. Starbucks		2*
WEST VIRGINIA				
1	Randolph Co. Kumbrabow Forest	A. F. & B. J. Schulz	2	5
2	Grant Co. Bayard to Henry	K. H. Anderson & G. L. Lewis	10	3
3	Pocahontas Co. Thorny Creek	R. W. Bailey	3	4
6	Mason Co. Old Town-Igloo	H. C. Dahl	4	5
7	Tucker Co. State Route 32	James Beach	5	4
OHIO				
1	Ashtabula Co. Austinburg	J. V. & H. E. Thayer	13	4
2	Ashtabula Co. Dorset	M. C. Gilfillan	5	5
3	Ashtabula Co. Morgan	J. V. & H. E. Thayer	1	3
4	Ashtabula Co. Andover	M. C. Gilfillan	13	16
5	Ashtabula Co. Ashtabula	P. Savage & P. E. Evans & B. E. & J. L. Budd	18	21
6	Portage Co. Twin Lake	Carl A. Carlozzi	1	2
8	Erie Co. Castalia	R. Gettell	22	17
9	Fulton Co. Maumee Forest	E. Ruffing	18	9
10	Delaware Co. Route 229	M. D. & M. C. Gilfillan	4	4
17	Lake Co. Mentor	J. A. Hague	2	3
12	Warren Co. Springfield	W. D. McGillard		4*

Table 1.--Woodcock Singing Ground Census for 1955 and 1956 (Continued)

Locality and Route No.	Observer	No. Occupied Singing Ground 1955	1956
OHIO (continued)			
13 Highland Co. Rocky Fork	Mutter		1*
14 Vinton Co. State Route 327	R. J. Schuerman		2*
15 Vinton Co. Zaleski State Forest	R. J. Schuerman		2*
KENTUCKY			
1 Bath Co. Sand Road	John Storner	0	0
2 Edmonson Co. Sloans Crossing	Dan M. Russell	7	3
3 Todd Co. Millers Valley Road	W. L. Gault	0	0
4 Christian Co. Bennettstown Road	Jerry Wunz	11	1
5 Hardin Co. Ord. Comp. Gate	Bruna & Rensel	2	4
6 Montgomery Co. Highway 213	T. A. McGowan	0	1

* First run in 1956, new lines

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WOODCOCK BREEDING GROUND COUNTS IN THE CENTRAL-NORTHERN UNITED STATES 1956

John W. Aldrich

U. S. Fish and Wildlife Service, Washington, D. C.

Banding data are beginning to show that the central-northern section of the United States - the area naturally clothed with the northern hardwoods and their associated conifers is the primary production area for woodcock hunted in the Mississippi River drainage. We therefore look to this interior north country particularly for indication of the current fortunes of this popular game bird when it comes to setting hunting regulations. For this reason we were sorry to note a general decrease in the amount of participation in our cooperative woodcock count in the area this year. Number of routes covered fell from 52 in Michigan in 1955 to 48 in 1956, from 5 to 3 in Wisconsin and from 8 to 3 in Minnesota. It is impossible to avoid circumstances which prevent obtaining the same degree of coverage each year, particularly on cooperative counts, and it is hoped this decline is temporary and that it will be possible in future years to cover at least the same counts worked in previous years. It should be stressed again that there is little value in running a route for only one year. The chief value is in being able to compare data from the same route in two consecutive years.

For the manpower expended to cover these routes this year we are indebted to the Conservation Departments of the three States involved as well as the individuals listed in the following tables. The organizations supplying this assistance were:

Game Division
Michigan Department of Conservation

Division of Game and Fish
Minnesota Department of Conservation

Game Management Division
Wisconsin Conservation Department.

Table 1.--Woodcock breeding ground counts in Central Northern States

1956

Locality and Route No.	Observer	Total No. Trips	Total Birds Heard All Trips	Total Stops All Trips	Av. No. Birds Per Stop	1955 Av.No. Birds Per Stop
MICHIGAN						
1 Alger Co. Stutts Creek	L.J.Verme	2	23	22	1.045	.879
4 Allegan Co. Manlius	C.J.Erickson	2	2	16	.125	.042
59 Allegan Co. Bear Creek #1	C.E.Friley,Jr.	2	8	14	.571	
60 Allegan Co. Gables Corner #2	C.H.Douville	2	7	12	.583	
37 Baraga Co. L'Anse,Silver R.	R.R.Rafferty	1	10	8	1.250	1.438
38 Barry Co. Clear Creek	P.H.Pann	3	26	27	.963	.778
61 Barry Co. Rutland Twp.#3	C.F.Storkan	3	25	30	.833	
5 Barry Co. Yankee Springs	"	3	23	30	.767	.633
62 Barry Co. Yankee Springs #2	"	3	15	27	.556	
6 Chippewa Co. Johnswood #1	Vogt and Schemenauer	2	26	22	1.182	1.364
40 Chippewa Co. Beavertail	J. Vogt	1	8	9	.889	.889
8 Chippewa Co. Dunbar #3	"	1	2	8	.250	.500
9 Clinton-Shiawassee Co., Rose Lake	Bill Goudy	3	34	21	1.620	1.250
13 Gladwin Co. Cedar River	A.Gene Gazlay	1	10	11	.909	.955
63 Gladwin Co. T18NR1W, #2	"	1	11	13	.846	
64 Gladwin Co. Beaverton #1	"	1	8	12	.667	
42 Gratiot Co. Gratiot-Saginaw #2	L.L.Blank-enship	1	9	7	1.286	1.000
15 Houghton Co. Hopes Creek	R.R.Rafferty	1	9	7	1.286	.857
17 Ingham Co. Danville #2	Vic Janson	1	4	8	.500	.500
18 Ingham Co. Dansville #3	D.W.Douglas	2	7	13	.539	.533
19 Iron Co. T43N-R31W	Ivan Thomson	2	23	20	1.150	1.000

Table 1.--Woodcock breeding ground counts in Central-Northern States-1956 (contd.).

Locality and Route No.	Observer	Total No. Trips	Total Birds all Trips	Total Stops all Trips	Av. No. Birds Per Stop	1955 Av. No. Birds Per Stop
MICHIGAN (Contd)						
46 Isabella Co. Chippewa #2	Irene F.Jarae	1	6	8	.750	.556
22 Kalamazoo Co. Kalamazoo #1	H.L.Potts,Jr.	1	10	11	.909	.622
21 Kalamazoo Co. Alamo #2	Gladys A.Hall	1	7	11	.636	.583
23 Kalamazoo Co. Augusta Creek	R.D.VanDuesen	1	6	9	.667	.900
65 Kalamazoo Gull Lake Outlet	"	1	6	10	.600	
24 Lake Co. T17N,R12W #1	P.Baumgras	2	10	16	.625	1.250
26 Luce Co. McPhee's Landing	O.DeWaard	1	17	9	1.889	1.000
66 Luce Co. Natalie, Newberry Twp.	"	1	14	8	1.750	
50 Mackinac Co. Carp River #1	J. Vogt	1	12	11	1.091	.818
67 Mason Co. Northern part	Tom Mackin	2	11	22	.500	
27 Midland Co. Dow Corning Area	B.Winchell	1	8	6	1.333	1.571
29 Newaygo Co. Bridgeton	E.Roossinck	1	6	7	.857	.857
28 Newaygo Co. T16N,R12W, #1	P.Baumgras	2	13	17	.765	.800
53 Oakland Co. Bald Mt. #1	T.Fairbanks	2	10	12	.833	1.833
54 Oakland Co. Highland Rec. Area		1	9	10	.900	.500
30 Ogemaw Co. Greenwood Rd.	Lawrence Ryel	2	15	18	.833	1.167
68 Ontonagon Matchwood North	Mrs.R.Lahde	1	3	3	1.000	
55 Ontonagon Co. Matchwood South	"	1	5	6	.833	1.750
32 Otsego Co. Ford, T29N,R2W	Otto Failing	2	9	14	.643	.286
34 Roscommon Co. T22N,R4W, #1	W.L.Palmer	1	15	12	1.250	1.000
35 Roscommon Co. Michelson #2	"	1	9	11	.818	.727

Table 1.--Woodcock breeding ground counts in Central-Northern States - 1956 (contd.).

Locality and Route No.	Observer	Total No. Trips	Total Birds all Trips	Total Stops all Trips	Av. No. Birds Per Stop	1955 Av. No. Birds Per Stop
MICHIGAN (Contd)						
69 St. Joseph Flower Field, Rocky R.	James Linder	1	1	6	.167	
58 St. Joseph Co. Fabious, Mill Creek	"	1	3	8	.375	.208
57 Schoolcraft Co. Driggs R.	D.McGlauchlin	2	6	18	.333	.593
70 Schoolcraft Co. Pine Crk. Rt.	"	1	7	7	1.000	
36 Van Buren Co. Almena #1	Gladys A. Hall W.F.Freyburger	3	29	33	.879	.933
71 Van Buren Co. Almena Rd. #2	Gladys A. Hall	1	5	11	.455	
MINNESOTA						
2 Cook Co. Bally Creek Rd.	M.H.Stenlund	1	4	9	.444	.444
8 Lake Co. Fernberg Rd.	"	1	5	8	.625	.667
9 Winona Co. Whitewater Twp.#1	Wm.H.Longley	1	1	8	.125	.125
WISCONSIN						
1 Langlade Co. Ackley	E.J.Tucker	1	12	14	.857	.615
2 Lincoln Co. New Wood	E.D.Morrison	3	23	36	.639	.833
3 Marathon Co. Marathon - 153	D.L.Corbin	2	5	16	.313	.875

Table 2.--Woodcock breeding ground count summary, Central-Northern States - 1956

State	Total Routes	Total Birds all Trips	Total Stops all Trips	Av. No. Birds Per Stop Per Trip
Michigan	48	542	651	.833
Minnesota	3	10	25	.400
Wisconsin	3	40	66	.606
TOTALS 1956	54	592	742	.798
TOTALS 1955	65	868	1081	.803
Difference				-.005
Change				0.6% decrease
Total 1956 for routes run both years (41)				.831
" 1955 " " " " " (41)				.804
Difference				+ .027
Change				3.4% increase

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MASSACHUSETTS WOODCOCK STUDIES

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Summary

1. There were 203 captures of woodcocks in summer nets at two sites. There were 182 individual birds including five returns. There were 21 repeats.

2. A relatively higher sample of male adults was captured.

3. Repeats and returns suggested birds taking part in summer evening flights are definitely residents.

4. Evidence of four years suggests the phenomenon of summer evening flights is dietary in nature and is not uncommon.

5. One return offered evidence that juvenals do not molt primaries the first year.

6. The adult hen-chick ratio was 1:1.5 as compared to 1:2.4 in 1955. It is suggested this may be a valid index to check accuracy of spring census techniques.

7. Age and sex composition of summer captures is presented.

8. Possible application of findings to management of species is discussed.

Techniques

New Japanese mist nets were used this year. These were nylon nets with larger mesh and somewhat heavier threads than the warbler silk nets used a year ago. The specifications of the new nets are 110 denier nylon net, 2-1/2" mesh, 4 shelves. Of standard length and construction, they were much easier to erect. Proper tension was uniform, and in one netting area, a bank of nets covered an area of over 100 feet long and 14 feet deep. One pole was used between the ends of two adjoining sets of nets.

These new nets were highly efficient. Approximately 90 per cent of the birds hitting them were captured. Most escapes occurred when a bird hit the edge of the net. There was practically no breakage, and it was not possible for a bird to fly through the net even if set tightly as occurred occasionally with the light nets.

For three weeks in July, two netting sites were run simultaneously, thereby increasing captures.

Each bird captured was sexed, aged (when possible), weighed, and the fifth primary from each wing removed.

Sixteen birds molting some of their primaries were collected in late summer and will be aged by probing the bursa of Fabricius.

Results of Netting

There were 203 captures during the summer. One hundred and eighty-two individual woodcocks were netted. Five of these were returns. One hundred and sixty-one were banded and released. Twenty-one of these individuals were recaptured at the same time during the summer as repeats.

Netting operations took place on two of the netting sites described in the 1955 report. The site on Prescott Peninsula was operated from June 11 to September 15. This site was not in operation during 10 days in July when the second site at the south end of Quabbin Reservoir was started up. The second area was operated for 29 days. One hundred and four birds were captured on Prescott Peninsula and 78 birds at the second site identified as "M.D.C.". The great majority of birds were caught in July.

Sex and Age Ratios.--Analysis of the sex and age ratios in each area showed no significant difference (Tables 1 and 2).

Table 1*

Sex and Age Ratios of 136 Massachusetts Woodcocks in Percentage - Summer of 1956

	Prescott	MDC	Totals
Juv. ♂	33.8(26)**	30.5(18)	32.4(44)
Ad. ♂	22.1(17)	18.7(11)	20.6(28)
Juv. ♀	16.9(13)	15.3(9)	16.2(22)
Ad. ♀	27.2(21)	35.5(21)	30.8(42)
Total Juv.	50.7(39)	45.8(27)	48.6(66)
Total Ad.	49.3(38)	54.2(32)	51.4(70)
Total ♂s	55.8(43)	49.0(29)	53.0(72)
Total ♀s	44.2(34)	51.0(30)	47.0(64)

* August captures often could not be accurately aged and thus are not included in the totals.

** Numbers in parentheses indicate number of individuals.

In contrast to the results in other years when less than 100 birds were captured, the nets yielded a substantial sample of male adults. Inspection of Table 1 suggests the results may not be a valid reflection of the sex and age composition of a resident population. It is possible that substantially more birds will have to be captured to represent a fair sample. There is no statistically significant difference in the total over-all sex ratio, but there is a significant difference between the number of male and female chicks. The reason for the definite majority of male chicks (66 percent) is not evident. Male adults may well be less inclined to make crepuscular forays after two months of intensive breeding activity which could account for the larger number of female adults caught in summer netting.

The over-all sex ratio of 353 birds captured and sexed in summer during four years is 120 males:100 females.

In early July it was not unusual to see groups of three birds fly over the field, and on one occasion, four birds in a group were observed. It was almost as common to see two birds together or following each other closely as a single bird. It is possible three or four groups of birds early in the summer comprise a single brood. On the night of July 3, eight chicks and two adult hens were captured in about 15 minutes at the MDC netting field. These results on the surface suggest two broods, but these captures came from each direction of the compass over a period of 15 minutes, and with one exception of two caught simultaneously, all were caught as single birds. Field observations of flushed broods indicate it is not unusual for four chicks to flush together and light in almost the same spot.

It is my tentative conclusion that by the time juveniles attain sufficient growth and strength to take part in these evening flights, the brood entity has broken down.

Discussion of reasons for evening flights.--After four years of observation of these evening flights, the total evidence indicates without much question these forays are dietary in nature. If undisturbed, these birds will remain in a field often as long as half an hour or possibly longer. One bird lit in the field, and after only eight minutes, was flushed into a net and immediately killed. His stomach was crammed with freshly eaten food items which included a caterpillar, two or more wireworms, remains of several beetles, beetle and diptera larvae and ants. His gizzard contained the remains of one angleworm which must have been eaten elsewhere as these evening lighting grounds are very dry and hard and probing is not possible. Such insect items have on several occasions, been identified in woodcock stomachs by other workers, but usually comprised a minor percentage of the stomach contents. It has been assumed that

woodcocks sought such prey during periods of drought when angleworms were less available. Evidence of these summer studies indicate that in early July when the birds are most active, drought conditions do not exist. In one instance, two young males caught in a grouse trap bordering an extensive wet alder swamp were netted a mile and a half away 10 days later. During this year there were extensive alder swamps in excellent condition for birds to feed in during most of July. Furthermore, the birds are most active in visiting the fields on humid or rainy days when presumably more earthworms would be available elsewhere.

The principal conclusion to be drawn from this discussion is that invertebrates other than earthworms comprise a substantial part of the woodcock's summer diet. Such food is only available during summer since the first frosts cause the death or hibernation of many of these organisms. Results of an analysis of a number of stomachs collected in summer will be reported on later.

Evidence that this phenomenon is not unusual is being gathered from other sources. Single observations by two cooperators in different sections of the state report evening flights including watching birds light in fields. An older sportsman who hunted woodcocks in the days when the season opened in July, described shooting birds in quantity at dusk as they were lighting in an open, dry hillside. Evidence that woodcocks behave similarly during summer throughout their breeding range is awaited with interest.

One ecological requirement characterizing these summer feeding fields appears to be small, clear patches of ground or grass well flattened such as a trail. Long, rank grass is not attractive.

Analysis of temperatures, humidity and precipitation showed no positive correlation between weather conditions and number of birds observed. In a broad sense, the average number of birds seen with a daily mean temperature above 70°F was higher than with a mean below 70°. There was also a higher average of birds seen on evenings with a relative humidity exceeding 70.

There may well be some correlation between ground insect activity and bird activity. Days with abrupt changes of temperature such as occurs with a series of thunder showers seemed to stimulate bird activity. The same type of weather often causes insect hatches. More detailed study of this is required before any definite conclusions can be made.

Resident status.--Lack of repeats in other years posed the logical question as to whether these evening flights represented mass movements of birds from one region to another - a sort of local migratory behavior. Evidence during the quarter indicates these birds definitely comprise a resident population. In Prescott Peninsula,

returns have demonstrated that birds caught at the netting site have, at some time during the year, been trapped at distances of at least two miles away from the netting field. Woodcock habitat on Prescott is widespread, and apparently birds are drawn from a wide radius. The chances of catching repeats in a field of about 1/4 acres are therefore quite remote. During the past summer, only five repeats were taken out of 104 individual birds captured on the Peninsula. In the MDC netting area, the woodcock habitat is more restricted and considerably more concentrated. Out of 78 birds, 16 or 20 per cent were recaptured as repeats. Several caught in early July were recaptured in August. This percentage of repeats is as high as could be expected with the method of netting employed. It is rarely that more than a third of the birds observed in an evening are captured.

Five returns were taken at Prescott which in addition to those reported in former years provide further evidence that the netted birds comprise a resident population. Table 2 portrays the history of each return.

Table 2

Returns Netted on Prescott Peninsula - Summer 1956

Number	Sex	Date & Location first captured	Method of Capture	Date Netted	Approximate Distance
50-301755	♂	4/9/51-singing site 050-1	Singing ground trap	6/14/56	1.5 miles
553-50160	♂	5/14/55-singing site 50-54	" " "	7/11/56	3/4 mile
553-50204	♂	7/9/54-Prescott	Net	7/10/56	0
553-50286	♀	9/20/54-Prescott	Net	7/25/56	0
553-50260*	♀	7/16/55-MDC	Net	7/24/56	10

* This bird was a juvenal caught at the MDC site in 1955 and apparently returned to breed on Prescott Peninsula

Weights.--The July weights of juvenals and adults of both sexes show a broad overlap (Table 3).

Table 3

Weight Ranges and Averages in Grams of
112 Woodcocks captured in July 1956

Sex	Age	Weight Range	Average	Number of Birds
♂	Adult	127 - 162	145.9	19
♂	Juvenal	117 - 149	140.4	30
♀	Adult	163 - 202	182.9	27
♀	Juvenal	151 - 192	168.8	16

After August 1, all birds started to gain in weight. This is best illustrated by the changes in weight of eight repeats presented in Table 4.

Table 4

Changes in Summer Weight (in gms.) of Eight Juvenile Woodcocks

Sex and Age		Date first Caught	Weight when first caught	Date of second capture	Weight on recapture	Weight Gain
♀	Juv.	7/3/56	154	9/12/56	177	23
♀	Juv.	7/3/56	165	8/27/56	187	22
♀	Juv.	7/3/56	165	8/28/56	184	19
♀	Juv.	7/3/56	166	8/28/56	182	16
♂	Juv.	6/23/56	121	7/23/56	124	3
♂	Juv.	7/6/56	139	7/30/56	142	3
*♂	Juv.	7/3/56	117	7/24/56	138	19
♂	Juv.	6/23/56	121	7/23/56	124	3

* July weight gain probably due to growth rather than accumulation of fat

It will be seen by Table 4 that with the exception of the male caught July 3 and weighing only 117 grams, juvenals gain little weight in July. The indication is that most juvenals have attained mature growth by the time they take part in evening flights. The weight gain of the birds caught in August probably parallels a similar gain in adults due to fat accumulation rather than growth.

Molting.--The first evidence of molt was observed July 16, but most molting takes place in August and the first two weeks of September. Observation a year ago, during a molt study, suggested juvenals do not molt their primaries until their second summer. It has also been observed that adults molt their three outer narrow primaries simultaneously. One solid piece of evidence was turned up indicating juvenals do not molt these outer primaries the first year. In 1955, the top inch of each outer primary was clipped off for later sex verification. One return caught this year (#553-50260) and first netted as a juvenal in July 1955, still had a clipped outer primary thus indicating this feather was not molted the first year.

The two fifth primaries of each bird were collected this summer. Cursory examination under a binocular microscope suggests the separation of adults and juvenals in July is valid and obvious on the basis of feather wear. In this instance, one is comparing a primary of an adult which has gone through two migrations with a juvenal about eight weeks old. To use this technique in the fall will require separation of primaries of juvenals which will be 5-6 months old, and adults with new primaries approximately two months old. Further study of collected specimens and summer primaries will be completed during the next quarter.

Adult hen-chick ratio.--As an index of annual success in production, it is suggested that a comparison of the adult hen-chick ratio of summer captured birds may be valid. It is of interest that in 1955 the adult hen-chick ratio was one hen to 2.4 chicks; in 1956 the adult hen-chick ratio was 1:1.5 suggesting rearing success was significantly less in 1956. Because of the question of the validity of the netting sample where juvenal males outnumber juvenal females by 2 to 1, it is doubtful if the figures given above protray true rearing success. It seems logical, however, that as an index of productivity, the figures may be valid.

As will be discussed under application of these findings to management, it is of importance that the MDC hen-chick ratio be separated from the Prescott Peninsula figures. In 1956 the hen-chick ratio at MDC on the basis of 48 birds was 1:1.3. On the basis of only 27 MDC captures in 1955, the hen-chick ratio was 1:2.8. If these samples are adequate, there may prove to be a correlation between the spring adult male census which might be expected to show a drop in 1957.

Application of these Findings to Management of the Species

The possible significance and application of these findings to management falls into three phases.

1. Open fields frequented by woodcocks during summer to feed on insects may well be an integral part of woodcock habitat. It is probable that any breeding habitat contains such fields since in all summer areas observed, the same openings were used as singing grounds in the spring. Several singing grounds on roads or very small openings would not be suitable as summer feeding grounds.

2. By further molt and head study, it is hoped to develop a technique to separate age classes of woodcocks by wing or head examination in the fall. Although the bursa technique is valid, it is difficult to examine any quantity of specimens in one season. If aging by examination of wings or heads is possible, it would be relatively simple to collect good samples in all the breeding areas. Such a sample would serve as a valid index to check our present inventory technique.

3. In the local netting areas in the vicinity of Amherst, sufficient summer samples should be netted to give a hen-chick ratio which will serve as an index of annual productivity. This will be checked against the local inventory each spring as a further test of inventory technique. Area #2 offers an ideal experimental ground for this. All the singing grounds are known and are relatively accessible and concentrated. Spring trapping will be resumed in this area.

PRELIMINARY ANALYSIS OF WOODCOCK BAND RETURNS

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Much of the information in this manuscript was used through the courtesy of (1) the Section of Distribution of Birds and Mammals, U. S. Fish and Wildlife Service, (2) the P-R Section, Louisiana Wild Life and Fisheries Commission, (3) S. Liscinsky, Pennsylvania Game Commission, (4) William Sheldon, Massachusetts Coop. Wildlife Research Unit, (5) H. Mendall, Maine Coop. Wildlife Research Unit, (6) B. Wright, N. E. Wildlife Experiment Station and (7) L. Blankenship, Michigan Conservation Department.

Of all our migratory game birds, the American woodcock has presented the most difficult migrational problems. Despite concerted effort to obtain data for this species, many migration facts remain a mystery.

The information derived from band returns is perhaps the most reliable source of migration data. However, the number of usable band returns for the American woodcock is so small that at the present time the plotting of all return sites on a map shows only probable travel routes. Therefore the reader is cautioned that the migration patterns suggested in this manuscript are rather speculative in nature. However, they are bolstered by information gained from many conversations and much correspondence with game biologists throughout the woodcock's range plus a fairly thorough review of the literature.

Return locations of bands obtained from outside the state of banding are shown on the map in Figure 1. This map contains all woodcock long distance band returns on file in the U. S. Fish and Wildlife Service Bird Banding Office. The solid dots represent recovery locations for woodcock banded in the South; the crosses for those banded in the Northeast and the Maritime Provinces, and the inverted "V" for those banded in the Lake States.

Since little difference was detected in migration routes when band recoveries were plotted by season of recovery or when plotted according to time lapse between banding and recovery, all recovery locations were plotted on the same map. In examining the map it must be remembered that migratory woodcock are not confined to a narrow corridor but rather they are spread over a broad region, the breadth of which may be so wide as to preclude calling it a zone. It is probable that the extent of the area covered during migration is governed by the size of the geographic regions supplying suitable cover and soil moisture. Both of these factors, but especially cover, undoubtedly exert a great influence on the length of time woodcock remain in an area and therefore determine to a great extent the probability of the birds being discovered. Woodcock probably cross in a short time

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(1) L.S.U. School of Forestry and Agricultural Experiment Station and Wildlife Department, Texas A & M.

large expanses of intensively farmed lands and are not detected; whereas they may spend several days traversing an equal distance where good cover exists and in which they are frequently found by hunters.

In much of the Mississippi and to a lesser extent the Ohio Valley, the best woodcock cover is confined to streambottoms, while in the more rugged country of the eastern part of the United States the better woodcock cover is apt to be found on the hilly-plateaus which are bisected by many small streams and on which there is often extensive forest and brush cover.

There are other factors that undoubtedly influence the detection of woodcock, such as number of hunters in an area, date of woodcock season, its relation to other game seasons, etc.

In general it is believed that major movements of woodcock occur in the zones indicated by the arrows on the map and that birds occupying adjacent areas converge toward the lines and move in the general directions as shown by the arrows.

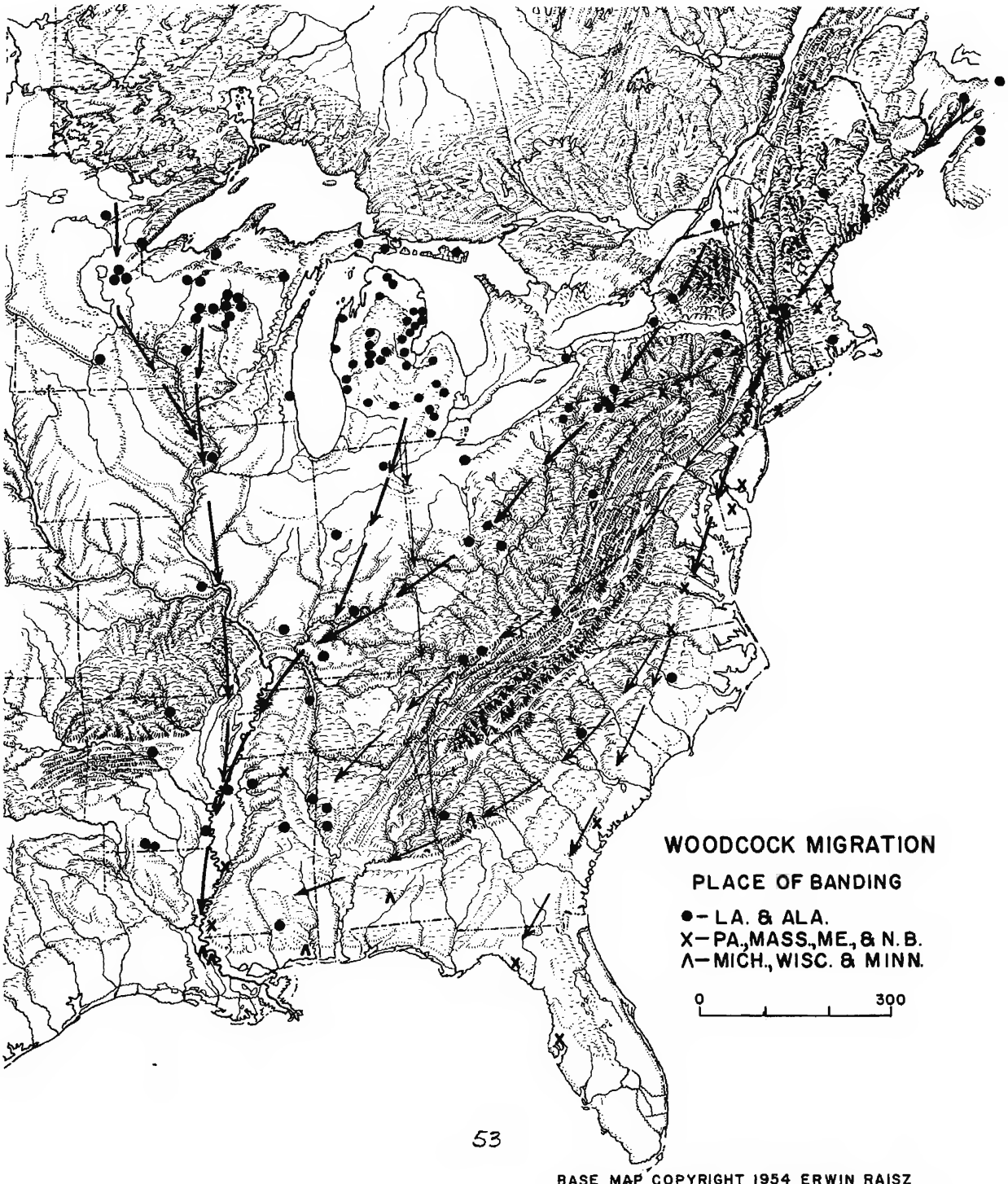
Atlantic Route

Based on the pattern of movement shown on the map, it appears that woodcock follow a more or less direct route between winter and summer range. The bulk of the woodcock from the Maritime Provinces and New England apparently remain east of the Appalachians. They follow the coastal area of Maine; take a direct course across west-central Massachusetts to northern New Jersey and Delaware where they continue on a fairly straight route to the South Atlantic States. From Virginia southward, migrating woodcock may diminish in numbers in mild winters. It is very likely that woodcock from the eastern Appalachian Region move east and south in this zone. Some of these birds may follow a wide sweeping route around the southern tip of the Appalachians to the Gulf Coast States of Alabama, Mississippi and Louisiana.

Appalachian Crossings

It is believed that there are two general areas in which woodcock move out of the Atlantic route across the Appalachian Mountains. The first of these is in the southeastern New York - northeastern Pennsylvania region. Birds using this crossing continue southwestward on a route travelled by woodcock from western New York State.

The second crossing covers a general region about the latitude of western Virginia and eastern Kentucky. Woodcock using this route probably enter the mountain valleys in Virginia and move south and west skipping from one valley to the next and emerging from the mountains in eastern Kentucky.



BASE MAP COPYRIGHT 1954 ERWIN RAISZ

Perhaps some of these birds follow the Great Valley or segments of it. This valley, which is made up of a series of valleys, begins in the upper Lake Champlain region and extends to north-central Alabama. In southwestern Virginia the western rim of the valley is broken by rivers which flow toward the Ohio River. Divides formed by these rivers provide a convenient crossing for woodcock.

The Ohio Valley Route

Woodcock from New York State and perhaps parts of Quebec and Ontario move along a route through western New York and northwest Pennsylvania, where they are joined by birds coming from New England. From this junction point, they move down the Ohio Valley to the Mississippi River and thence south. Many Michigan woodcock follow this same route from southern Indiana. However, some woodcock from Michigan migrate about due south to the Gulf States.

Mississippi Valley Route

Because of intensive farming in the Mississippi Valley most of the good woodcock cover is restricted to streambottoms. Therefore it is likely that woodcock breeding in Wisconsin and Minnesota migrate along the Mississippi River.

Rate and Number of Band Recoveries

A thorough analysis of woodcock band returns cannot be made until the third or fourth year after banding. Thomson (1929) in summarizing returns from 284 European woodcock stated that 95 per cent of the bands had been received by the end of the fourth year. Sheldon (1956) indicates that there is an annual mortality of 43 per cent of adults and 69 per cent of chicks for the American woodcock. From the banding of 2128 woodcock in Louisiana, 93 bands were returned by the end of the third year, with annual cumulative rates of 54, 87 and 94 per cent.

The 93 bands represent a return of 4.4 per cent of the 2128 woodcock. Forty-three bands (2.0%) were returned from outside Louisiana while 50 (2.3%) were recovered in Louisiana at least one or more migration seasons later.

It is evident from the hiatuses that appear on the map based on the small return of bands from outside the states of banding, that many more woodcock must be banded in order to depict migration routes accurately.

References

Sheldon, W. G. 1956. Annual survival of Massachusetts male woodcocks. Journal Wildl. Mgt., 20: 420-427.

Thomson, A. L. 1929. The migration of British and Irish woodcock. British Birds 23: 74-92.

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WILSON'S SNIPE WINTERING GROUND STUDIES, 1955-56

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Field work during the winter of 1955-56 included: (1) The fifth annual mid-winter Abundance Index of the Wilson's Snipe in the southern states; (2) Further testing of random ground transects in southern Louisiana; (3) Further testing of aerial transects; (4) Continuation of banding snipe in Alabama, Mississippi, Louisiana and Texas; (5) Appraisal of habitat conditions in the Tampico marshes. Results of the mid-winter counts and the snipe figures from the National Audubon Society's Christmas Bird Count have been tabulated and tested for statistical significance. And a plan for future coverage has been developed.

Wilson's Snipe Abundance Index

During the five-day period, Jan. 25-29, 132 counts of wintering snipe were conducted in 15 southern states. As usual, many areas that had been visited in the previous January were not covered this year, and a number of new areas were initiated. Furthermore, some observers continue to make observations entirely from their vehicles and these counts cannot be directly compared with the vast majority which are taken on foot and which specify the amount of foot coverage. Seventy-one percent of the 1956 counts (94 areas) are suitable for use in a comparison of 1955 and 1956 populations. Some of the remaining 29 percent can also be put to use if they are revisited next year.

The left half of Table I gives a summary by states and administrative regions of the number of snipe recorded per hour of foot coverage in areas that were checked in both 1955 and 1956. The right half of the table is based on the areas in the left half plus those that were covered only one of the two years. Although the figures in the last two columns at the right are based on about half as many more areas each year as are those in the left half of the table, the inclusion of areas covered one year but not the other has drastically affected the more comparable data and very greatly lowered the statistical accuracy. The important figures in this table, therefore, are those in the second and third columns of figures. The total percentage change indicated by this table is an increase of 35 percent, which nearly compensates for last year's drop.

Knowing that these indicated percentage changes cannot be taken at their face value (because of the vast area concerned, the relatively small size of the sample that was covered, and the many variable factors involved), the data obtained were subjected to the null hypothesis to determine whether a significant change in abundance had

occurred between the two years. Results showed that the 1956 figures were not significantly different from the 1955 figures either in Region 2, Region 4, or for the entire area covered.

Table 1.--Winter Snipe Count - 2-year comparison based on coverage by foot only

	Areas covered both years			All areas		
	Number of areas	Snipe per hour 1955	Snipe per hour 1956	Additional areas	Snipe per hour 1955	Snipe per hour 1956
Region 1.						
California	1	2.3	0	6	7.9	20.1
Region 2.						
Arizona	0	--	--	2	--	10.1
Colorado	0	--	--	2	--	--
New Mexico	5	1.5	0.8	6	3.3	0.7
Texas	7	4.2	2.7	8	4.1	10.6
Utah	8	6.5	2.8	2	5.5	2.8
Total, Region 2	20	4.5	2.3	19	4.1	6.7
Percent change, Region 2		-49%				(+62%)
Region 4.						
Alabama	2	2.0	2.0	11	20.2	3.6
Arkansas	4	14.4	4.8	13	5.1	4.8
Florida	6	28.8	12.1	7	22.4	9.7
Georgia	2	5.0	4.0	2	9.1	2.7
Kentucky	3	0.9	0.5	3	0.5	0.5
Louisiana	26	42.8	85.8	7	41.8	126.1
Mississippi	7	51.3	9.2	5	53.8	10.1
North Carolina	8	2.1	2.0	9	1.5	2.0
South Carolina	5	10.3	15.2	1	9.3	15.2
Tennessee	9	0.8	0.8	9	0.5	0.6
Virginia	1	2.0	0	3	2.0	0.5
Total, Region 4	73	24.9	34.8	70	19.8	41.6
Percent Change, Region 4			+39%			(+110%)
Region 5.						
West Virginia	0	--	--	2	7.8	--
TOTAL	94	20.08	27.06	97	16.31	32.97
Percent change			+35%			(+102%)

Data from Christmas Season Counts

Table 2 gives a comparison of snipe populations by administrative regions, based on the number of snipe per 100 party-hours on 200 Christmas Bird Count areas that were checked in both 1955 and 1956.

Table 2. Data from Christmas Season Counts Arranged by Administrative Regions

			Snipe per 100 party-hours		
Regions	No. of Areas 1954-55 and 1955-56	5-year average 1950-51---1954-55	1954-55	1955-56	% change
I	17	33.7	21	14	-34%
II	36	28.2	32	29	- 9%
III	31	4.0	3	5	+40%
IV	72	22.0	20	20	+ 3%
V	44	7.4	7	12	+67%
Total	200	17.0	17	17	+ 2%
Change from previous year			-10%	+2%	

Table 3. Data from Christmas Season Counts Arranged by Flyways

Flyway		No. of areas	1954-55	1955-56	% change
Pacific	Wash., Oreg., Calif., Utah, Ariz.	22	31.90	23.14	-27%
Central	Mont., Wyo., Colo., N.Mex., Kans., Okla., Tex.	31	26.39	25.12	- 5%
Miss.	Minn., Wis., Mich., Ill., Ind., Ohio, Mo., La., Ky., Tenn., Miss., Ala.	49	10.90	8.67	-21%
Atlantic	Mass., R.I., Conn., N.Y., N.J., Pa., Del., Md., D.C., Va., W.Va., N.C., S.C., Ga., Fla.	98	13.36	17.49	+31%
Total		200	16.82	17.31	+ 2%

The same data provided the information for Table 3, which gives figures by flyways instead of by regions. The latter grouping permits more accurate statistical analysis. Figures for all four flyways were subjected to the null hypothesis and it was found that no significant change in population from 1955 to 1956 was indicated in any flyway or for the country as a whole.

Appraisal of Sample Size

In order to appraise the accuracy of the present methods and to plan intelligently for the type and amount of coverage that is required to give the information we need in the future, several statistical tests have been applied to the data obtained through mid-winter counts and Christmas season counts.

Since the data are not normally distributed, but highly skewed, a logarithmic transformation was determined to be proper. Since the logarithm of zero does not exist, it was necessary to add a constant figure to each observation before making the transformation. The number 1 was selected arbitrarily, as this also eliminated the necessity of using any negative logarithms. The coefficient of variation "C" was computed by analysis of variance for each flyway and for the country as a whole, for both sets of data: the Mid-winter Count and the Christmas Season Count. Then the sample size needed to detect changes in population of specified amounts was obtained by the formula

$$n = \frac{t^2 C^2}{p^2}$$

, where t is the number of standard errors for a 95 percent probability of occurrence (roughly 2, but varying according to the size of each sample), and p is the percent of sampling error allowed (or the amount of change that the population must exceed in order that the change can be detected).

Table 4 shows the number of trips (computed on the basis of 1955 and 1956 figures) necessary in each flyway and for the entire country in order to detect population changes exceeding certain percentages. The underscored numbers show the category into which the 1955-56 observations fall, giving an approximation of amount of population change that could be detected in each flyway by each set of data.

It is acknowledged that neither set of data has been set up on a random basis, thus violating a cardinal assumption on which statistical treatment is based. Furthermore, the only uniformity in coverage is through the presentation of all data in terms if birds per unit time of coverage and the insistance that each area be covered as uniformly as possible from year to year. It is believed that within areas of low snipe density (which would include nearly all parts of the country except California and the Gulf Coast area) the errors resulting from lack of random distribution and identical coverage are

quite unimportant. The Christmas Count areas were selected without regard to snipe occurrence, they have a maximum radius of 7-1/2 miles, and they include in their coverage all states except Nevada. The Winter Count areas, being many fewer in number, are less well scattered, but since they were selected for the specific purpose of counting snipe, the numbers seen per area average ten times as high. They were selected largely at the convenience of the participants (who themselves were distributed at random with respect to snipe distribution). A series of random counts has been run for the past two years throughout southern Louisiana. Since the results of these are comparable with those obtained through the regular mid-winter counts, and since Louisiana has the greatest concentrations of any state, there is no reason to believe that failure to provide a completely random sample has invalidated the results of the study.

Table 4. Sample Size Required to Detect Specified Changes in Snipe Population by Mid-winter Counts and by Christmas Season Counts

	Mid-winter Counts				
Percent Change	Pacific	Central	Miss.	Atlantic	TOTAL
20%	28	119	92	82	94
25	18	76	59	52	60
30	13	53	41	37	42
40	7	30	23	21	24
Sample size (1955-56)	9	12	50	21	92

	Christmas Season Counts				
Percent Change	Pacific	Central	Miss.	Atlantic	TOTAL
15%	100	69	126	158	151
20	56	39	71	89	86
25	36	25	46	57	55
30	25	18	32	40	38
Sample size (1955-56)	22	31	49	98	200

Comparison of Mid-winter and Christmas Season Counts

We can make a further test by plotting the figures obtained through the mid-winter count, together with their estimated error, to the same scale as corresponding figures from the Christmas season counts. Figures 1 and 2 show the bands within which the actual population index would be expected to lie according to the two separate methods of estimation. The median line in Figure 1 connects the total snipe per party-hour for each year from 1952 through 1956. The vertical limits of the band represent 20 percent deviations (see Table 4) from this line. Similarly, the median line in Figure 2 represents number of snipe per 100 party-hours of Christmas Count coverage, increased by a constant percentage (7.4%) to make the average figure by this method coincide with the average by the other method. The width of the band indicates a deviation of 15% from the center line (see Table 4). Since the width of both bands is based on a percentage, the width is greater for high values of the center line than for low values.

In Figure 3 the bands based on the two types of count are superimposed. If the Counts by the two methods had been similarly distributed and if there had been no change in populations between late December and late January, we would have expected some overlapping area in each of the five years. The actual index figure of snipe abundance for each year would lie somewhere within this overlapping area. It will be noted that there is fairly close agreement between the Mid-winter Count band and the Christmas Season Count band and that a downward trend in a given year by one method is balanced by an even or an upward trend by the other method. In other words, the snipe population has actually been more stable from year to year than has been indicated by any one method of estimating population trends. It is clear from Figure 3 that the continental snipe population has changed little if any during the five-year period.

Figure 4 shows the average (mean) abundance index for each year, as obtained from the two series of Counts. Although the trend appears to be downward, it is still within the margin of error demonstrated in Figure 3. There is no indication that re-opening the shooting season has had any measureable effect on the snipe population.

Suggestions for Future Coverage

Between 30 percent and 40 percent of the winter snipe counts cannot be used for year-to-year statistical comparison because they either: a) are not taken in the same areas for two or more successive years; or b) are taken entirely by car or by boat instead of on foot, and so cannot be used in statistical comparisons which are based on number of party-hours of foot coverage. As shown in Table 4, a total of 94 Mid-winter counts are required to enable us to detect a 20 percent change in snipe population.

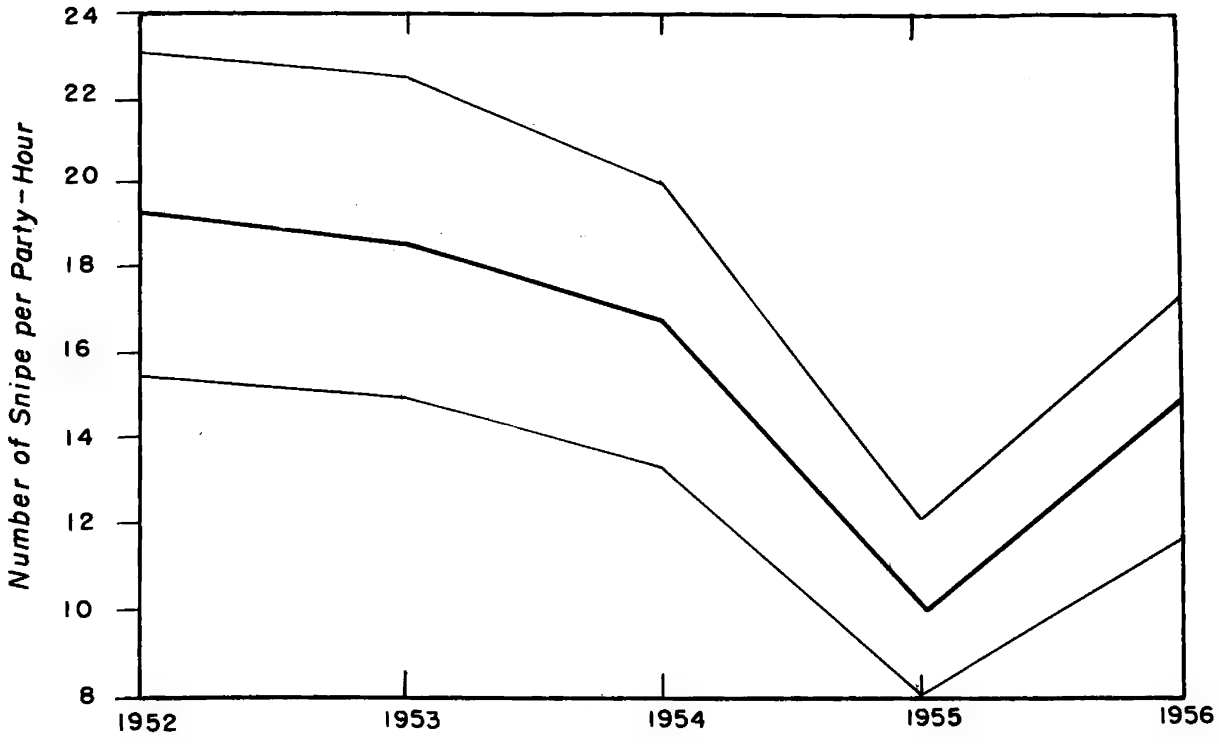

Figure I SNIPE ON MID-WINTER COUNT

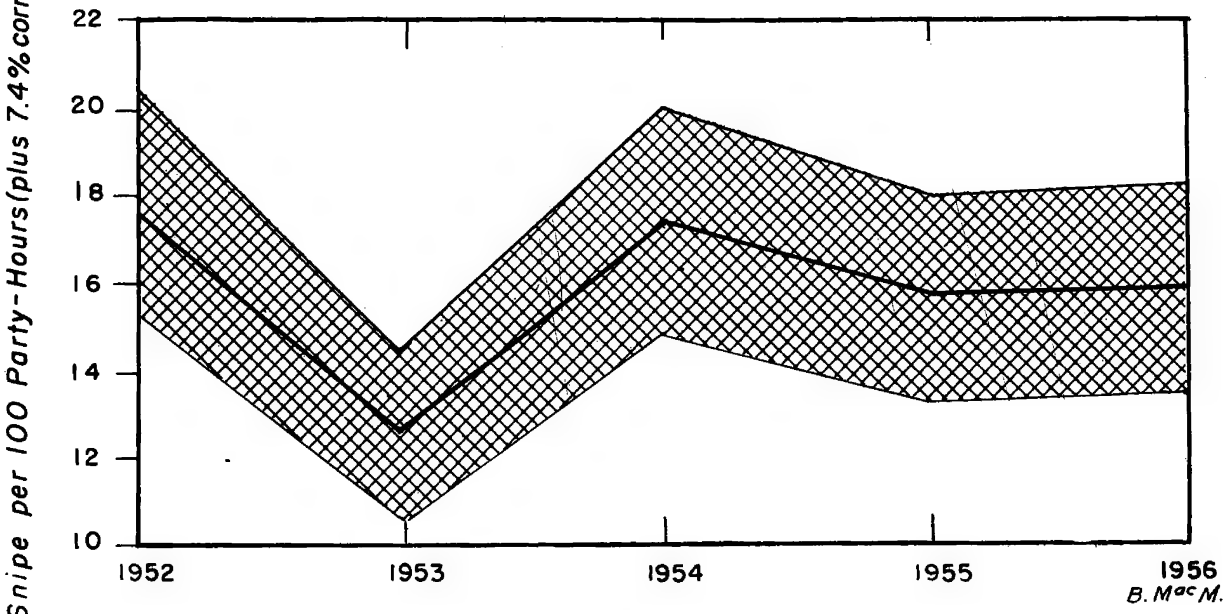

Figure 2. SNIPE ON CHRISTMAS BIRD COUNT

In order to assure receiving 94 usable reports in any one year, it appears necessary to obtain coverage of at least 145 areas, thus allowing for 35 percent to be rejected in statistical studies. By continuing to impress on all participants the importance of covering the same area every year, and of covering the most productive areas on foot, we should be able to reduce the number of rejected counts to some extent. However, there will always be unavoidable circumstances that will disrupt coverage, and no reduction in effort would be justified until it has been demonstrated that the necessary number of areas will continue to be covered.

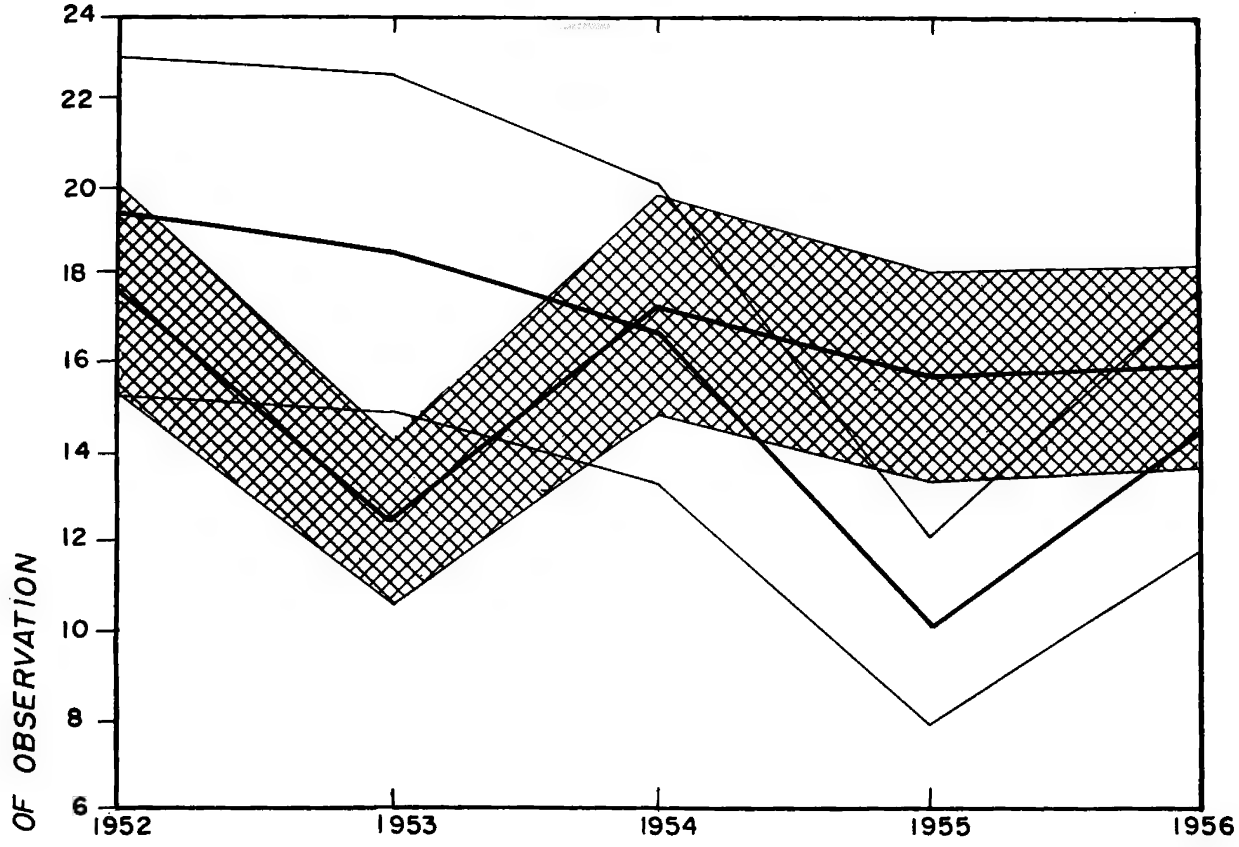

Figure 3. COMPOSITE PICTURE BASED ON MID-WINTER AND CHRISTMAS SEASON COUNTS

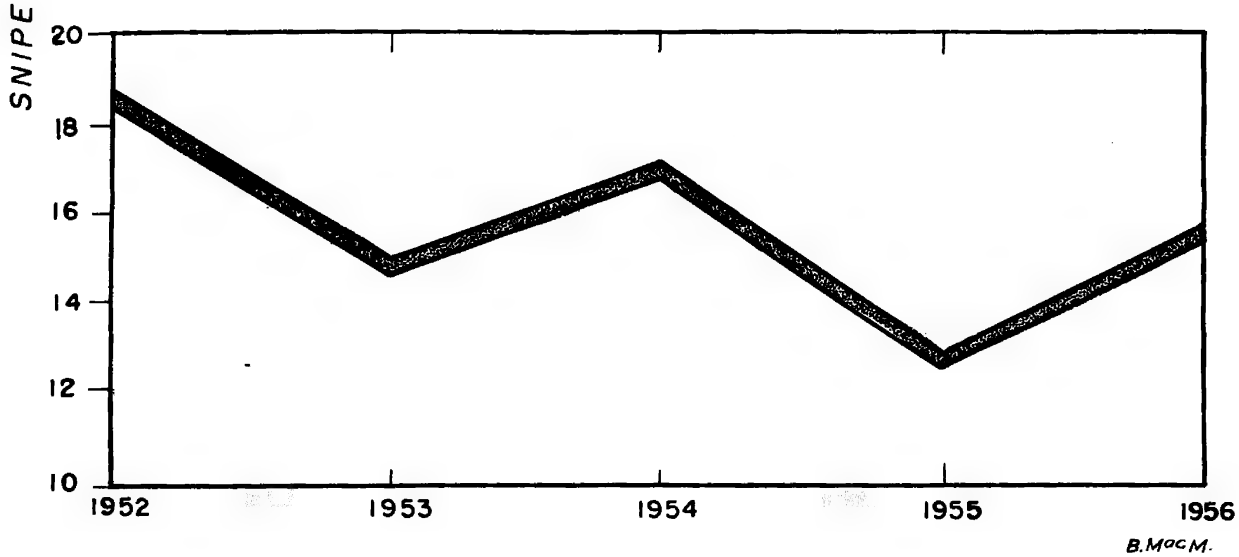

Figure 4. MEAN INDEX OF SNIPE ABUNDANCE

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ON THE BREEDING OF WILSON'S SNIPE IN NEWFOUNDLAND

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Introduction

Wilson's snipe studies in Newfoundland commenced in 1952 and have continued at intervals as time permitted. A report on nocturnal activity and the winnowing of the males as an index of breeding populations was published in the 1954 issue in this series (Special Scientific Report - Wildlife No. 28 pp. 41-50).

In 1956 the species was studied throughout the breeding period, during May on the Avalon Peninsula (Salmonier and Colinet), and during June and parts of July and August on the west coast (the Codroy Valley). A total of 122 snipe was captured and 73 banded and released. Adults were marked with coloured plastic bands and numbered metal bands and nestlings marked with metal bands numbered in the order of hatching to aid recognition in the field.

Most of the adults were captured by flushing them into silk mist nets from the nest or as they returned to their broods, or by luring them into the nets with play-backs of territorial calls on a tape recorder. The tape recorder was specially useful as the birds could be taken without flushing, sometimes within a minute or two of setting up the recorder.

Forty-nine birds (32 adults and 17 young) were collected, the adults for sex identification and the young for experimental rearing.

The study of Wilson's snipe in Newfoundland will be continued, and a comprehensive report published. The present paper is an interim report giving those findings considered most important to other workers.

Spring Migration and Courtship

Ordinarily the Wilson's snipe returns to Newfoundland in mid-April. In 1956 the first male was heard winnowing on April 25 (Cappahayden) and the first arched-wing display was seen on May 3 (Salmonier). The first arrivals (presumably males) are recorded from various parts of the island within a short period. The early arrival winnows over a large area, but later restricts his movements to one section of the marsh or bog, which becomes his territory when his mate arrives.

The later arrivals (presumably females for the most part) arrive singly over a period of two to three weeks. There is then a great deal of activity, vocal "yakking", aerial chases in which twos and threes participate, and winnowing. The arched-wing display described by Sutton in his "Notes on the nesting of Wilson's snipe in Crawford County, Pennsylvania" (Wilson Bull. 35:191-202, 1923) was observed frequently, and appeared to take place only when a female was nearby.

Winnowing by the male appears to rise to a pitch after the arrival of the female. The pitch is maintained until soon after the female begins to incubate and then decreases until it is negligible by the time the young are hatched. After lengthy observation I have reached the conclusion that females winnow only during the early phases of courtship. I have never recorded one doing so during incubation or even when disturbed with the brood. Early in the season five or even six winnowing birds may be recorded at night from a single locality when four was the normal number after the first excitement caused by the presence of females had levelled off. However, this may be because additional males are attracted into the area during the early phase of courtship.

The following instances are proof that females winnow:

Two birds which had been yakking and winnowing together during the early evening of May 17, 1954, at Swift Current alighted together on a reed bed and were collected. One was a male and one a female.

A bird was observed yakking and winnowing sporadically in early evening on May 18, 1954, at Swift Current. It was soon joined by another, presumably a male, which mounted above it in narrow circles and winnowed. The first bird soon afterward came down slowly, alighted near our tent, and was collected. It was a female.

Two birds were doing a considerable amount of yakking and winnowing, mostly at low level, at Salmonier about 9 p. m. on May 4, 1955. In a low sortie, they became enmeshed in the mist net. One was a male, the other a female.

Two birds were yakking and winnowing in close proximity during the morning of May 22, 1956, at Colinet. One was clearly trying to force the other to the ground. Soon afterwards they alighted together and copulation took place.

Territory

The boundaries of the male's territory appeared to be vaguely defined at first, perhaps because much of the land may be covered with water or even snow at that time. Few data were obtained during the period of pair formation, but once the female had commenced to incubate, it was evident that the territory was clearly defined. It was noticed that during the night, especially early in the breeding cycle, there were times of great excitement involving two or more birds. It was suspected that the territory might be defended even in darkness. Experiments with the tape recorder showed that there was no response after the post-sunset winnowing period until the winnowing period before dawn.

Primary requisites of a territory appear to be as follows:

1. A suitable nest site.

2. A suitable area for the male's station.--The station is an area within the territory where the male spends an increasing amount of time as incubation advances. It is always at a distance from the nest - about 500 feet on the average - and usually in dense cover. It may be a spot by the side of a brook, in a grassy meadow, or in a dense clump of sedges or rushes. As a rule it provides some food, but that does not appear to be essential. In several instances observed, the male occupied several stations in his territory for a varying number of consecutive days. When the female flies out of the nest, the male calls softly from his station until she is located. He usually commences the twilight winnowing from the station.

3. A suitable retreat for the female.--This is an area with some cover, near the nest, where she can go when disturbed. The most clearly defined retreats were in dense alder thickets, clumps of Myrica gale, or even dense coniferous forest. She often feeds alone in that part of the territory when off the nest. Usually she can walk back to the nest from the retreat without being seen, creeping along with the head down, taking advantage of even low grass cover, and darting over open places.

4. A feeding area.--In some cases this is a large part of the territory, in others it consists of a few choice sections. The male returns to the feeding area after his twilight winnowing period, and either or both birds may be flushed from it at night, when they are not otherwise engaged. The feeding areas I observed were used as such only in twilight or during the night.

Another interesting function of the male's station and the female's retreat is evident after the young have hatched. The female takes her

part of the brood to the retreat and the male takes his part to the station, although they may be in opposite directions. If the need for additional feeding areas arises, the territorial organization is abandoned, and the parents with their broods may wander at random.

Nesting

I have examined 18 nests. Most of them were built of fine grasses but a few were of fine, dry sedges. The lining was usually of fine grass, but in two cases it was of alder leaves. They were superior to those of any other wader that I have examined and were sturdy and compact enough to be lifted from the sites. Significantly, if the nest is built in grass cover, as is usual in low-lying meadows, the grass stems of the previous year's growth are interwoven at the top to form a canopy like those above the nests of other marsh dwellers, such as rails. When the grass is interwoven in this way, the bird enters the nest from the side. The interweaving may not be apparent to the casual observer, as it may be pulled apart when the bird is flushed. The canopy is probably an important factor in the survival of the clutch when the nest is flooded. One nest was covered by 6-1/2 inches of water on May 29. The floating eggs were retained by the interwoven grass, and 36 hours later, the water had subsided and the bird returned to the nest. The eggs were undamaged.

The typical nest site of Wilson's snipe in Newfoundland is in sphagnum moss. All 18 sites were in Sphagnum, except one which was in Cornus, in close proximity to the nest of a white-throated sparrow. That nest, too, was built on a base of moss, but the moss was Politrichum. The nest was well hidden by second-growth birches and balsam fir. The eggs in it hatched on June 8 - one of the earliest for the season.

The low cover is usually grass, but occasionally sedge or rush. This may be scanty when the nest is built, but soon grows up to cover it.

On the east coast, the woody cover, if there was any, was Myrica gale. In the Codroy Valley on the west coast, the woody cover was Alnus rugosa, except for the Cornus type nest, where the woody cover was small fir and birches. It may be significant that the last three nests found, on June 25, July 5, and August 8, respectively, were not in woody cover. However, the grass and sedges were so dense at that time that those three nests were the most completely hidden.

Fifteen of the nests had clutches of four eggs; the other three nests had clutches of three. A nest found on May 24 had a clutch of three, and still had the same number on May 26. A nest with three eggs found on June 25 was apparently deserted, and the eggs were later destroyed by a cow. That, and one other nest destroyed by a horse,

were the only cases of egg destruction observed. A nest with three eggs found on August 8 was hatched successfully on August 13.

Several residents of the Codroy valley assured me that in past years they had occasionally found nests in early August when they mowed the grass.

In a nest found on June 19 the eggs hatched on June 27. At that time no male was in attendance and none had been positively located. No male was recorded winnowing in the vicinity of the nest found on August 8 that hatched August 13.

Incubation.--Eleven pairs from the nests under discussion were colour banded, the incubating adults with a yellow band, the known males with a red band, and those whose sex could not be determined with a colour combination including green. Colour banding was not considered effective for identification except under ideal conditions of observation. Most of the observations were made from blinds or by relocating broods in the field. No nest was visited more than 11 days before hatching, and each was visited daily after its discovery if possible. The blind was usually set up in the late evening and care was taken to enter it from the rear, so that the bird did not flush or returned quickly after flushing. A flashlight held steady did not seem to disturb the nesting bird.

In several hundred visits to the 11 nests where pairs were banded, we did not record an instance of a known male incubating. In one instance the female left the nest for 15 minutes in the afternoon. The nest contained two active chicks and two unhatched eggs. The male appeared promptly and settled on the nest, brooding a chick under each wing. The study was not complete enough to justify generalization on the role of the sexes in incubation, but it would appear that the male's parental instinct is not very strong until the chicks appear.

During the early phases of incubation the female sets extended on the nest, with head and bill level. Any movement or noise by the observer causes her to ruffle her feathers, make soft clucking noises, or even raise her head. She may then walk quietly off the nest. Generally she walks in and out of the nest, but she sometimes flies to the nest site and walks only the last few feet, usually in a leisurely manner, with frequent displacement feeding gestures. When she gets close to the nest, it appears to attract her strongly, and she no longer hesitates. Before settling down she rolls the eggs with her body, sometimes turns them with her bill.

At hatching time the female appears very excited and becomes much less wary. She turns over the eggs frequently. Occasionally she straddles the nest with extended wings and keeps up a soft clucking. Disturbances at that time cause her to ruffle her feathers and fan her tail erect. Some females brood very closely and can be

lifted off the nest while the stage of incubation is being recorded. They hover on the fringe of the nest in great excitement, ready to settle down as soon as molestation is over.

The male usually remains at his station during the incubation period. Normally, he was not seen at the nesting site until hatching was in progress, although one male was flushed from the vicinity of the nest a day or two before hatching. In the very late nests the males were never seen in the vicinity of the nests.

The female on a nest where the eggs were addled finally deserted it after 25 days. By this time the winnowing intensity of the male had decreased in the twilight period to about three-minute intervals. During the three days after the female deserted the nest the pair made a good deal of noise in the vicinity, and it was suspected that the male was trying to drive her back to the nest.

Hatching.--The chick may be heard pecking 24 hours before actual hatching. By the time the shell is pipped the chick's call is audible 15 to 20 feet away. From pipping to emergence usually takes about an hour, but in several cases took considerably less. An hour after emergence the chick has dried off and becomes rather active.

There seems to be a considerable interval between the hatching of the first one or two eggs and the remaining ones. This is shown in Table 1, which records the hatching chronology of five of the study nests. The interval may be an important factor in the welfare of the chick, as indicated later under Parental Care.

Table 1. Sequence of hatch

Nest No.	1st. chick	2nd. chick	3rd. chick	4th. chick
10	12:30 p. m.	2:30 p. m.	3:45 p. m.	4:50 p. m.
11	12:45 p. m.	1:15 p. m.	(not hatched	6:45 p. m.)
12	9:00 a. m.	11:59 a. m.	2:00 p. m.	4:45 p. m.
13	1:45 p. m.	6:30 p. m.	7:50 p. m.	8:20 p. m.
18	12:01 p. m.	3:45 p. m.	4:45 p. m.	--

The nesting period for Wilson's snipe in Newfoundland appears to be rather protracted. As shown in Table 2, it extends from early June to mid-August. It seems likely that the first three weeks in June is the optimum period.

The table gives only 1956 data from the west coast. The early hatching dates from the east coast in other years were comparable. Young were recorded near St. John's on June 7, 1954, and young were flying at Salmonier on June 26, 1956.

Table 2. Hatching phenology of Wilson's snipe - Codroy Valley, 1956

Hatching date	Determination#
June 2	Flying young approx. 21 days on June 23
June 5	Flying young approx. 21 days on June 26
June 6	Flying young approx. 18 days on June 24
June 7	Hatching observed
June 8	Young approx. 10 days on June 18
June 8	Young approx. 14 days on June 22
June 10	Hatching observed
June 11	Young approx. 10 days on June 21
June 11	Young approx. 10 days on June 21
June 12	Young approx. 8 days on June 20
June 14	Hatching observed
June 14	Young approx. 5 days on June 19
June 15	Hatching observed
June 15	Young approx. 8 days on June 23
June 16	Young approx. 12 days on June 28
June 17	Young approx. 8 days on June 25
June 18	Hatching observed
June 18	Young approx. 5 days on June 23
June 21	Hatching observed
June 22	Young approx. 14 days on July 8
June 27	Hatching observed
August 13	Hatching observed

Method of aging described in section on Growth and Development

Hiding behaviour.--As soon as the young are dried off - about an hour after hatching - they are inclined to crawl out of the nest. At this stage the female broods them under her wings. It is doubtful that she can hold them in the nest very long, unless in the late evening or in cold or wet weather.

The tendency and ability of the chicks to hide, if not inherent are acquired quickly. One chick scarcely an hour old was thrown out of the nest when the female flushed. It immediately hid effectively under sedge roots at the base of the nest.

There did not appear to be any definite clue to the hiding places of young in the field. They took advantage of any cover. We were often able to recheck a brood quickly because the metal bands revealed their hiding places. Very young chicks may reveal their presence by cheeping when the parent bird returns. Also, on the second or third flushing they are likely to be found directly in the spot where they were being brooded.

The following incident may illustrate how the young disperse when danger threatens.

I flushed a female on the day after she had hatched her brood, and hid under a near-by spruce canopy to await her return. She soon came back, clucking softly. Two chicks appeared, one from a wet cow-track and the other from the base of a small clump of sedge, and were immediately brooded. After watching for ten minutes, I made an inadvertent movement that gave me away. The female made a soft churring sound and vibrated so violently that every feather seemed in motion. With this movement, the chicks shot out from under her as if they had been catapulted. One landed on its back about a foot away and lay as it landed. The other dived into a tiny crevice under a tuft of grass. In a flurry of wing-beats the female left the scene.

Parental care.--As with most birds of the family, young snipe have rather large feet when hatched. This enabled us to band them soon after hatching, often right after they had struggled out of the eggs. As previously mentioned, they were banded in order of hatching for identification in the field.

The following incidents may indicate the role of the sexes in the care of the young.

A female was still brooding all the young at 9 p. m. on June 15, the day of the hatch (Nest No. 10, Table 1). Presumably she continued to do so through the night. At 8 a. m. on June 16, the male with the two oldest chicks was found about 20 feet from the nest in one direc-

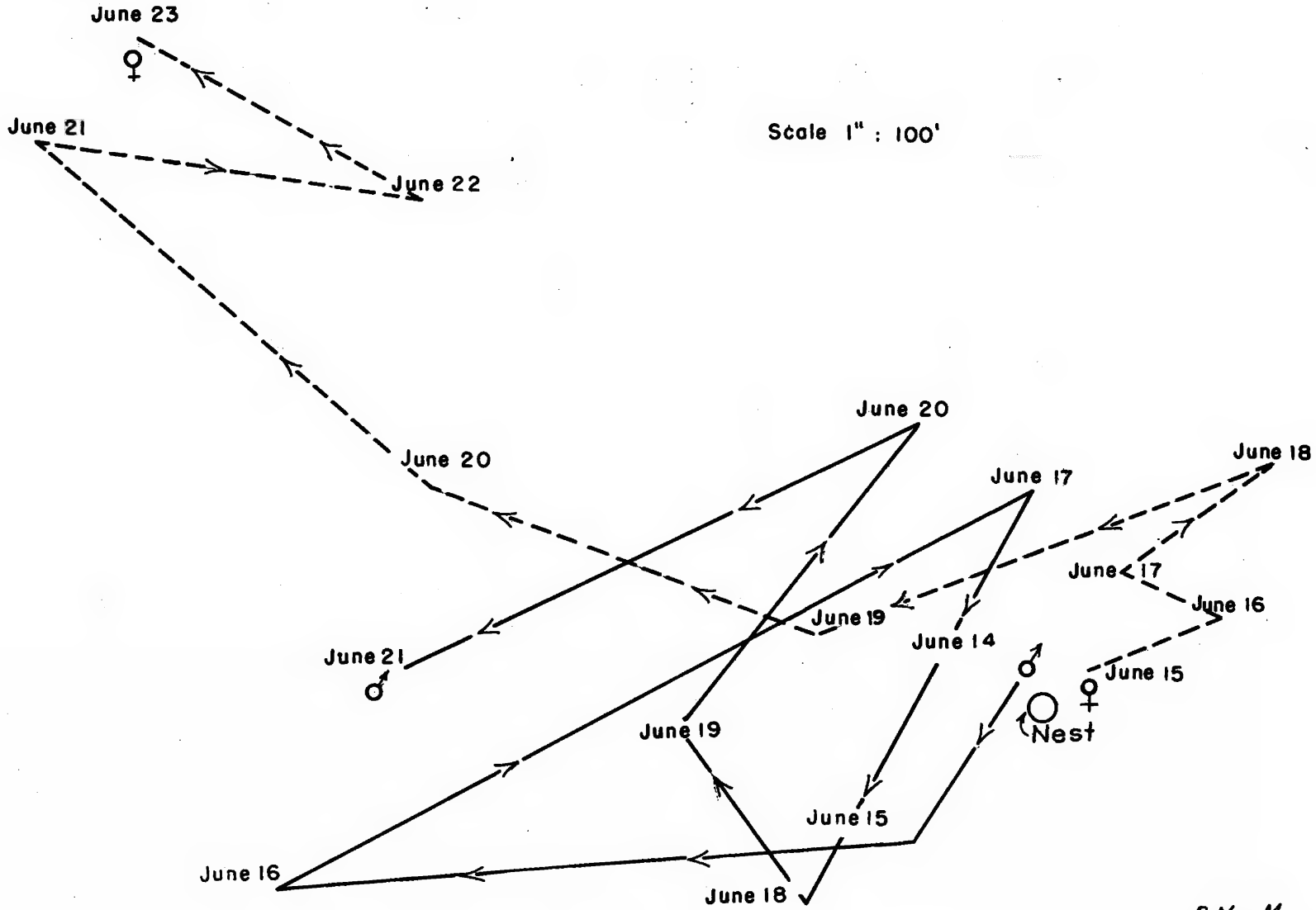

Fig. 1. Daily change in location of members of a pair of Wilson's Snipe with young from nest No. 12. Observations between 6 and 10 A.M.

tion and the female with the two youngest about the same distance from the nest in the opposite direction. By noon, the adults with their broods were 200 feet apart, and by 5 p. m. they were 500 feet apart. On the morning of June 17 they were eventually located about 600 yards from each other.

On June 10 it rained intermittently all day. The first two eggs in Nest No. 11 (Table 1) hatched in the early afternoon. This was the nest, mentioned above under "Hatching", where the male brooded briefly during the afternoon. As shown in the table, the last two eggs had not hatched at 6:45 p. m. At 6 a. m. on June 11 the female was found about 20 feet from the nest with the two youngest chicks. The male, with the two oldest, was located in a dense alder thicket some 300 feet away in the opposite direction.

Nest No. 12 (Table 1) hatched out on June 14. As shown in the table, the first chick in that nest was almost three hours old when the second hatched just before noon. In the meantime I had flushed the female from the nest and the male from a spot about four feet from it, and had located the oldest chick from the spot where the male flushed and replaced it in the nest. At 2 p. m. both older chicks were missing from the nest. At 4:45 p. m. they were located with the male about 200 yards from the nest. The movements of the two adults with their broods during the next few days were carefully traced and are shown in Figure 1. The trails crossed several times, but it was clear that the broods remained separate.

At Nest No. 13 (Table 1) the male was found at 8 a. m. on the morning following the hatch, with the oldest chick, six feet from the nest. The female with the other three chicks was flushed from the base of the nest. The nest was in dense, very wet cover, where the chicks must have had to cross small puddles of water to get clear. At 9 a. m. the male had taken the three oldest ten feet in one direction, while the youngest and presumably the weakest one remained with the female ten feet in another direction. This instance seems to idicate that the male takes the sturdiest and most active chicks when he has a choice.

At one nest where the sequence of the hatch was not obtained, the male was found with three chicks on June 19, the day following the hatch, 40 feet from the nest. The female remained at the nest, incubating an egg which later proved to be addled.

As shown in Table 1, Nest No. 18 contained only three eggs. The female went on brooding on this nest several hours after the eggs were known to be hatched. She was relocated with her young on August 14, the day after the hatch, about 15 yards from the nest with the three chicks.

Brood size.--On my observation cards for Wilson's snipe dating back to 1941, there are only nine entries of downy young. One refers to a brood of three not long out of the nest, the others are for broods of two or for single chicks. In 1956 it was realized early that any bird showing distraction display had a nest or brood near by. It was nearly always possible to capture an adult attending a brood by hiding until it returned to the brood and then flushing it into a mist net.

Table 3 summarizes the brood size data, all obtained in the Codroy Valley in June and August. It is believed to contain no duplication, as broods found not banded were banded immediately.

Table 3. Summary of brood sizes of Wilson's Snipe - Codroy Valley, 1956

Date	Accompanying parent: Male	Female	Unidentified	No. in Brood	
June 8	X			1)	K*
June 8		X		3)	
June 10	X			2)	K
June 11		X		2)	
June 14	X			2)	K
June 14		X		2)	
June 15	X			2)	K
June 15		X		2)	
June 18	X			2	
June 18		X		2	
June 18			X	2	
June 19		X		3	
June 19			X	2	
June 20	X			1	
June 21			X	1	
June 21			X	2	
June 22	X			3)	K
June 22		X		1)	
June 23	X			1	
June 23		X		2	
June 23		X		1	
June 24			X	2	
June 25	X			2	
June 26			X	2	
June 26		X		2	
June 27		X		3)	K
June 28			X	1	
June 28			X	2	
August 14		X		3)	K

* NOTE: The symbol K designates broods known to have come from one clutch

Growth and Development.--Broods which became available because the adults were collected were restrained and fed artificially to obtain data on growth and development. Measurements in the field of captured banded young of known age provided controls on the growth measurements.

The juvenal plumage appears first on the back and scapular regions and then on the breast and wing coverts. The primaries break from their sheaths at about the 11th day and then grow rapidly. Young snipe commence their first flights at between 15 and 18 days of age, and are able to fly quite well on the 20th day. At that time the measurement of the wing from the elbow joint to the tip of the longest primary is approximately 100 mm., and the upper mandible is about 45 mm. long. A fairly accurate rule of thumb for aging young in the field is to allow 2 mm. per day for the upper mandible and for the length of the wing 20 mm. on the 11th day and 10 mm. per day thereafter. The retrices commence to grow out after the 17th day and are only half developed when the young commence to fly. A week after flight, perhaps longer, there are still traces of down and the head has an immature appearance. Young four or five weeks of age cannot be told at a glance from adults, but often reveal immaturity by cheeping.

Figure 2 shows the rapid development of the wing in comparison with the slow growth of the mandible.

In the rearing experiments the first three broods were lost, but the fourth and last was raised successfully. Earthworms, cut in small pieces, appear to be a satisfactory diet, if grit is also provided. The chicks were force-fed at first but would take food from forceps or fingers after a day or two. The earthworm diet is deficient in water which must be provided after each meal.

Until the feathers are fairly well developed, the young may go into a coma when wet or cold. They can sometimes be revived by holding them in a towel or warm oven. Artificial heat must be provided at night and at regular intervals during the day to compensate for the heat they normally get from brooding. They must be warmed, fed, and watered at regular intervals, even during the night. I attribute success with the last brood to keeping them in my bedroom at night with a can of worms nearby.

Feeding habits.--I have observed adults feeding young up to the flying stage. In no instance have I observed chicks feeding themselves, although those raised experimentally would pick up food at 10 days of age. In the wild, the chicks remained motionless as the adult probed and then crowded in to pick the sediment from her bill as she raised it after probing. The comparatively slow growth of the young snipe's bill may account for its slowness in feeding itself. Certainly that slowness, and the necessity for brooding the chicks closely, are factors which make it necessary for the parent birds to divide the brood between them.

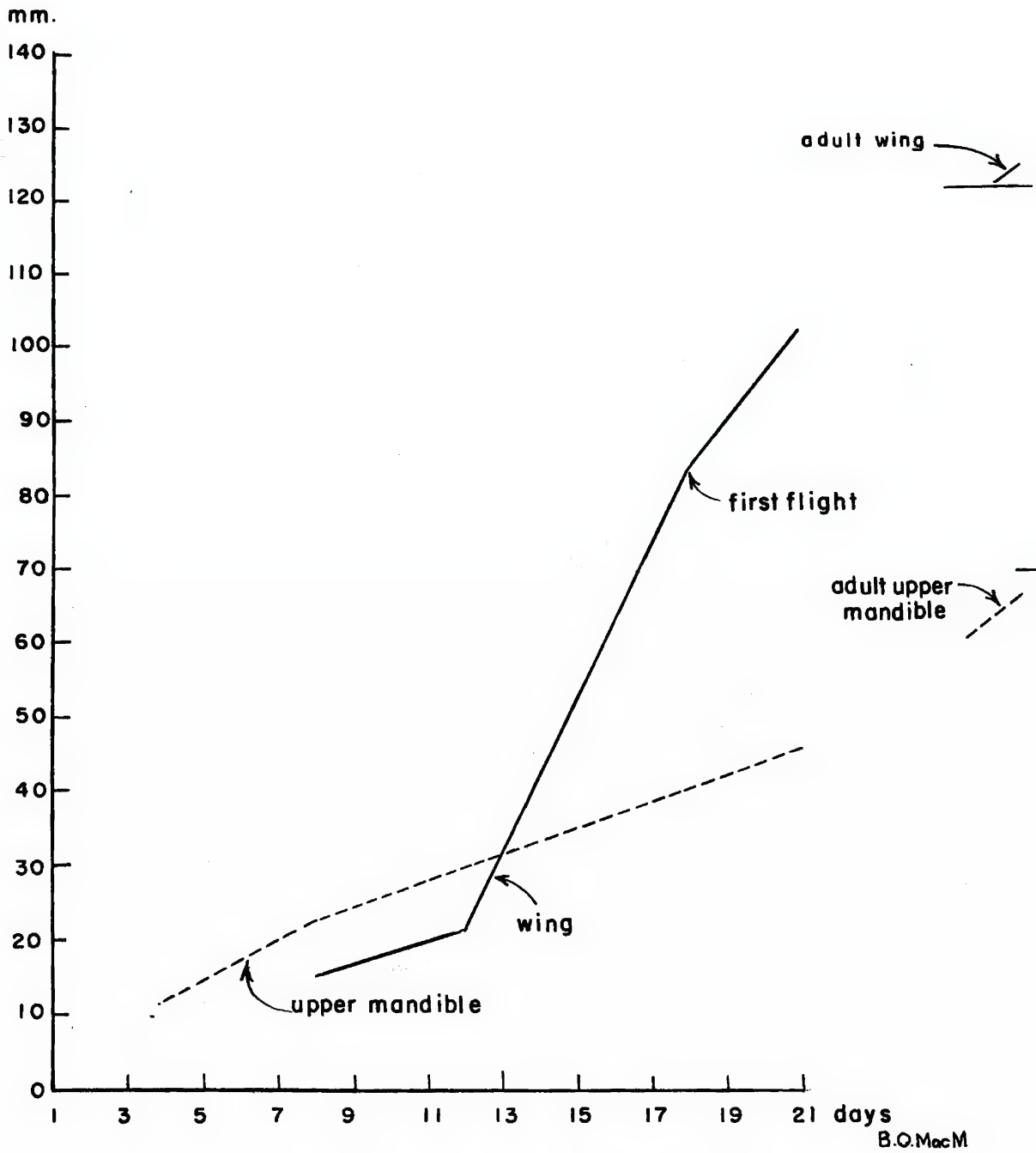

Fig. 2. Development of wing of Wilson's Snipe in relation to growth of bill.

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CLAPPER RAIL STUDY

Fred Ferrigno

New Jersey Division of Game and Fish

Basically the purpose of the study is to determine the annual population trends of the clapper rail. In addition, information is to be gathered in regard to initial nesting dates and the effects of high tides on nesting success.

Study Areas and Techniques Used

Two study areas, Coney's Area, Marmora, and Keye's Area, Corsons Inlet, were censused from May 14 to July 28. Nests were located in the same manner as described by Schmidt (1950). When nests were located, numbered stakes were placed in their vicinity. Subsequent visits were made almost weekly until all nesting had ceased on the study areas. Each nest was closely observed until it was either destroyed or hatched successfully.

Weather and Water Conditions

Precipitation was above normal during April and May. Frequent rains also occurred throughout June and July. Temperatures throughout the spring were extremely low for that particular time of the year. Unusual freezing weather was common throughout April and May, resulting in a retardation of nesting cover. During June and July, excellent growing conditions resulted in a very lush vegetative growth.

Findings

An examination of the field data (Table 1) reveals that on Coney's Area, 20 nests were under observation during 1956. Sixteen, 4 less than 1955, hatched successfully. Four nests were destroyed by flood tides.

On Keye's Area, 10 nests were observed, nine of which hatched successfully. This represents an increase of 5 successful hatches over the previous year. Flood tides were responsible for the destruction of the remaining nest.

Table 1. Results of the Clapper Rail Nest Census During 1955 and 1956.

Area	No. Observed Nests		No. Destroyed (By Tides)		No. Hatched Successfully	
	1955	1956	1955	1956	1955	1956
Coney's	29	20	9	4	20	16
Keye's	7	10	3	1	4	9
Total	36	30	12	5	24	25

The effects of abnormally high tides on clapper rail nesting were not as severe in 1956 as in 1955. High tides of June 8-11, 1955 resulted in virtually complete nest destruction. Consequently, a considerable amount of renesting occurred which accounted for the later hatching peak (Fig. 1). During 1956, the usually high lunar tides were present but only one high tide was accompanied by strong winds. This tide, on May 10, came at a time when rails were just commencing to nest, and therefore did not have any harmful effects on nesting. Three nests were destroyed with clutches of 1 to 2 eggs. Flood tides, around June 8, 1956, eliminated only 2 (14 percent) of 14 nests under observation. This tide was undoubtedly the cause of the limited amount of renesting.

On the basis of data gathered from Coney's and Keye's Areas, it is presumed that no substantial change took place in the production of the clapper rail. However, during 1956, early nesting attempts were much more successful. Eighty-three percent of first nests hatched successfully.

The increase of nests on Keye's Area, and decrease on Coney's Area is attributed to nesting cover. Many large barren areas are now present on Coney's. These sections formerly supported good stands of saltmarsh cordgrass (Spartina alterniflora). Possibly either adverse weather conditions or the overpopulation of fiddler crabs contributed to this kill of vegetation.

Based on the hatching dates and a 60-day interval to flight stage, by August 27, approximately 50 percent of the young birds should be on the wing. By September 7, or earlier, 80 percent will be flight birds. The remaining 20 percent should have complete flight feathers by September 26. In view of this, the usual opening date appears to be justifiable.

Harvest

Since early nesting attempts were much more successful in 1956 than the previous year, it was assumed that more young birds would be on the wing during the early part of the hunting season. Consequently, it was expected that hunters would fare well at that time. Nevertheless, the results on opening day did not live up to expectations; many hunters complained about the scarcity of birds. Later in the season, during the abnormally high tides of hurricane "Flossie", numerous birds and limit kills were reported. Evidently, the high tides prior to the season and especially the dense cover, was responsible for the poor early season results.

With such a variation of opinions of many hunters and personnel on the clapper rail harvest, there is a definite need for a method for proper evaluation. In view of this, an effort was made to obtain field data by conducting hunter bag checks. Even though the sample is too small, it does give some indication on how hunters fared on a few different areas. Table 2 shows that the best results were obtained on the Palermo, Seaville, Ocean City, and Marmora marshes. It is difficult to ascertain just what constitutes a good harvest. Taking into consideration the number of inexperienced rail hunters that were afield, the annual number of 4 birds per hunter day appears to be a good kill. Hunter utilization and success on Egg Island and Heislerville marshes were poor and were probably attributable to the dense cover rather than a scarcity of birds.

Table 2. Hunter Bag Check of Clapper Rail During the 1956 Season

Area	No. Hunters	No. Rails	No. Rails per Hunter
Tuckerton	37	109	2.9
Avalon	9	29	3.2
Seaville-Palermo	21	90	4.3
Egg Island	8	1	.1
Heislerville	2	1	.5
Ocean City-Marmora	3	12	4.0
Totals	80	242	3.0

Summary

1. The annual clapper rail nest census was conducted on two study areas in Cape May County.

2. The 1956 rail production was equivalent to production during 1955. However, early nesting attempts were much more successful.

3. The results of hunter's bag checks on several different marshes indicated that hunters fared fairly well on some marshes and poorly on others.

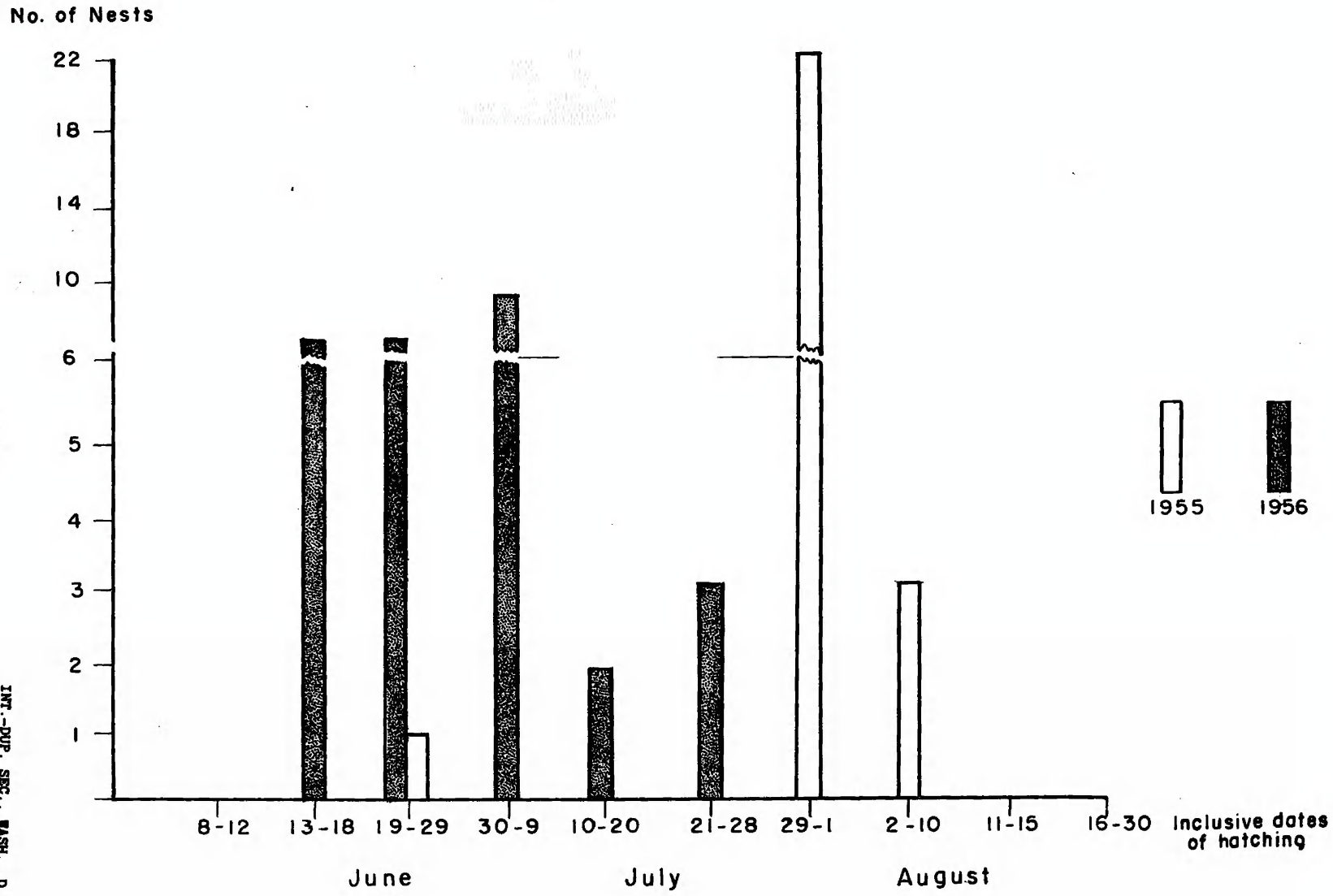

Figure 1. Hatching periods of Clapper Rail eggs on two Study Areas during 1955 and 1956.

B. Mac. M.

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